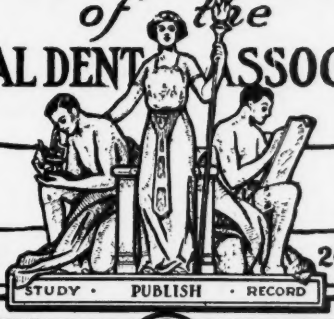
MAY 15 1919
UNIV. OF MICH.

The JOURNAL of the NATIONAL DENTAL ASSOCIATION



VOLUME VI NUMBER FIVE

$2.00 A YEAR 20 CENTS A COPY

MAY, 1919

Some Timely Thoughts With Reference to Gold Foil.—*Prime.*

The Patron Saint of Dentistry.—*Kelley.*

Experimental Pyorrhea.—*Howe.*

Simplified Method of Casting Gold Inlays.—*Volland.*

Orthodontic Interference in Malocclusion.—*Kelsey.*

A Study of the Behavior of Plaster of Paris.—*Mathis.*

The Overfilling of Pulp Canals.—*Best.*

Experiment in the Study of Cellular Anaphylaxis.—*Larson-Bell.*

Continue to Support the Red Cross.—*Editorial.*

1919 Aim 32,000 Subscribers

CONTENTS

Page

Lieut. Commander W. N. Cogan.....Frontispiece

ORIGINAL COMMUNICATIONS.

Some Timely Thoughts on Pure Operative Dentistry With Special Reference to Gold Foil.
By James Mark Prime, D. D. S.....391
Saint Apollonia—The Patron Saint of Dentistry.
By Henry A. Kelley, D. M. D.....400
Experimental Pyorrhea.
By Percy R. Howe, A. B., D. D. S.....413
A Simplified and Rational Method of Casting Gold Inlays.
By R. H. Voland, D. D. S., M. D.....422
The Necessity for Orthodontic Interference in Malocclusion of the Teeth.
By Harry E. Kelsey, D. D. S.....428
A Study of the Behavior of Plaster of Paris as an Investment in the Process of Vulcanizing Dental Rubber.
By E. H. Mathis, B. S., D. D. S.....432
Is the Overfilling of Pulp Canals a Safe Procedure?
By Elmer S. Best, D. D.S.....446
Dental and Oral Hygiene in Relation to Public Health.
By Louis Ottofy, D. D. S., M. D.....449
The Perfusion Experiment in the Study of Cellular Anaphylaxis.
By W. P. Larson and E. T. Bell.....453

EDITORIAL DEPARTMENT.

Every Citizen Should Continue to Support the Red Cross.....458
Sure—We'll Help Finish the Job.....461
Recent Patents Relating to Dentistry.....461

ARMY AND NAVY.

Treasury Department.....462
Letter from Surgeon General to Preparedness League of American Dentists.....463
Increased Harrison Law Tax Unjust to Physicians.....464
Canteen Service.....464
"The Death Train," Harrowing True Story of Russia Today.....464
Red Cross Nurse First Woman to Receive D. S. C.....465
Dental Corps Orders from War Department.....465
Communication to National Dental Association Members from Madrid, Spain.....466
Wounded Men See New York.....468
Military Discipline.....468
13,101 Men Need Dentist; 1,577 Emergency Cases.....468

ANNOUNCEMENTS.

National and State Societies Meetings.—Semi-Annual Meeting of the Rhode Island Board of Registration in Dentistry.—Tennessee State Dental Association.—Connecticut Dental Commission.—Maryland Board of Dental Examiners.—Nebraska Board of Dental Secretaries.— Next Meeting of the National Dental Association, New Orleans, La.—Dental Alumni Society of the University of Pennsylvania.—Iowa State Board of Dental Examiners.—Committee of Dental Examiners of Illinois.—Michigan State Board of Dental Examiners.—Meeting of the Tennessee State Board of Dental Examiners.—Ohio State Dental Board.—The Florida State Board of Dental Examiners.—The Dental Society of the State of New York.—Northern Ohio Dental Association Meeting.—South Carolina State Board of Dental Examiners.—Change of Date.—Meeting of the Maine Board of Dental Examiners.—Annual Meeting of the California State Dental Association.—Missouri Dental Board.—The International Society of Prosthetists.—Northern Ohio Dental Society.—Oklahoma State Board of Dental Examiners.—The Board of Dental Examiners of Alabama.—West Virginia State Board of Dental Examiners.—Indiana State Board of Dental Examiners.—South Dakota State Board of Dental Examiners.—Annual Meeting of the Wyoming Board of Dental Examiners.—Annual Meeting New Mexico Dental Society.—Annual Meeting South Carolina State Dental Association.—New Jersey State Dental Society.—Virginia State Board of Dental Examiners.—Mississippi Board of Dental Examiners.—Meeting of the Vermont Board of Dental Examiners.—Annual Meeting of the North Carolina State Society.—Northwestern Annual Homecoming Clinic.—Board of Dental Examiners of California.—New Jersey Board of Registration.—Oklahoma State Board of Dental Examiners.—The Forsyth Dental Infirmary for Children.—New York's Action to Revoke License.—Announcement of the Journal of Dental Research.....469-481

IN MEMORIAM.

First Lt. Gale Friday.....482
James Eli Hurst.....482
Resolution, Dr. Vance W. Bliss.....482
Memorial Resolutions—Louis S. LaPierre.....482
Resolutions—Dr. W. E. Dieffenderfer.....483
Resolutions—Dr. Simeon H. Guilford.....483

ADVERTISING DEPARTMENT.

Index.....A-63
Classified Section.....A-59–A-61

LIEUT. COMMANDER W. N. COGAN,
Ranking Dental Officer, U. S. N., Washington, D. C.

THE JOURNAL

OF THE

National Dental Association

VOL. 6 MAY, 1919 NO. 5

Original Communications.

SOME TIMELY THOUGHTS ON PURE OPERATIVE DENTISTRY WITH SPECIAL REFERENCE TO GOLD FOIL.

By James Mark Prime, D.D.S., Omaha, Nebraska.

(Read before the National Dental Association at Its Twenty-Second Annual Session, Chicago, Ill., August 5-9, 1918.)

THE human mind and heart are always on the alert seeking something new, and different. This is a good thing, if properly directed leads to discoveries, and inventions. A discovery or invention may or may not be of value. Time usually tests their merit, and if the discovery or invention hold valuable truths and principles they will live even tho, for a time, they are "crushed to earth they will rise again." If experience proves them of no value they will pass into the oblivion of the forgotten past.

Dentistry is fertile in fads, and faddists. Many meteoric stars have suddenly illumined our vision to pass as quickly away, leaving us more blinded by their sudden brightness.

Operative Dentistry has had her full share of pyrotechnics. On the other hand some of our best work has been done along operative lines. Of late, Operative Dentistry has not, in my opinion, been attracting the attention it so justly deserves. We speak of that part of operative dentistry which deals with repair of damages done by caries. To this Dr. Black adds pulp complications, and the group of peridental diseases. We will speak of preventive measures only for the latter two.

How many in this room are practicing Operative Dentistry after the princi-

ples laid down by our great predecessor, in whose memory we unveil a monument at this meeting? This carving of stone will speak to coming generations of this man's greatness, yet greater, infinitely greater, is the monument unveiled to us thru the record of his life's work. Not the least among his valuable contributions are his masterful chapters on Operative Dentistry. Indeed there was no better field in which his wonderful mind could work. This essay will be confined largely to that filling material with which, and thru which, his genius found one of its most eloquent expressions.

Operative Dentistry as it deals with the repair of damages from caries stands in the foreground as a most valuable service. It is second to one only. We must concede to dental prophylaxis our first great duty. By it we may prevent both caries, and diseases of the peridental membrane. The operator who saves vital teeth, by permanent repair of damages from caries, surpasses the prosthetist, much as the surgeon who saves the leg surpasses the artificial limb manufacturer.

Is it not strange that the thing we are called upon to do most, and the thing wherein we perform the most valuable service to our patients (save one as mentioned) is the thing, as a rule, we do poorest? Might it not be explained by what the essayist once saw at a dental convention? A great crowd was pressing toward a table where a removable bridge was being demonstrated. At another where impressions for full dentures were being taken, it was impossible to get near. Seats were all occupied and standing room at a premium where a cleft palate operation was being performed. At the chair where a skillful demonstrator was doing prophylactic work there were two rather indifferent onlookers, and at the chair where a beautiful gold foil operation was being made there was one man, and he was assisting the operator. We seem to be bent on seeing something freakish, something new, an easier, and quicker way to do things. This is well enough, if, by so doing, we are enabled to do them better.

Bridges, plates, pyorrhea, focal infection, surgery, root-canal fillings, etc., are all worthy our most serious thought. Methods that will, as nearly as possible, prevent the necessity for these are preeminently our first great duty. If it is worth three hundred dollars, to cure a case of pyorrhea what is it worth to prevent it by prophylaxis? If a bridge, replacing a lost dental organ, is worth one hundred dollars, what is a permanent filling operation worth that will prevent it? Where does the trouble lie? Most people think it is with the public. We do not agree. We think the trouble is wholly with the dental profession, and will be, so long as we have ethical members of our profession guilty of telling patients, in whose mouths are beautiful gold foil fillings, "that teeth will not stand pounded fillings, that the nerves will die in all teeth having pounded fillings."

Shame on the man who, thru ignorance or dishonesty, spreads such falsehoods among ignorant patients. If he is present when the veil is rolled back from the statue of the great Black, his heart should ache with shame for having repudiated some of the most important and valuable teachings in our benefactor's life work. We believe the value of healthy dental organs, in their importance to the life and health of the patient, is appreciated more today than ever before. As this appreciation of their value grows upon us the more we cling to those proven methods for permanently preserving them.

This brings us to filling teeth with gold foil.

This will immediately arouse disinterest in some. In others prejudice, and animosity in many.

When your committee wired me asking for this paper their message con-

tained the suggestion that we are "drifting too far from basic principles." We agree with the suggestion. I shall offer gold foil operations as one of the basic things from which we have been drifting. To discuss the merits of gold foil operations does not condemn other methods and filling materials.

Successful dental operations consist in first, the ability to determine what is indicated in the case at hand, second the ability to perform that operation well.

It is surprising to know the number of modern dental offices wherein gold foil and the necessary instruments for using it, can not be found. What, a modern dental office and not supplied with the instrument and materials for making the best operation in a tooth known to our profession? Many confine their gold operations to the front teeth. These operations are the most difficult. We do not wonder at their becoming discouraged. Cavities in bicuspids, and molars are, as a rule, most advantageously filled with gold foil. They are made easily accessible in nearly all cavities, securing correct lines of force, with the new instruments now designed, which we will describe in a later essay.

Caution in Use of Dam.

As the dam must be applied in gold foil operations let us remember some dangers before us, if it is used carelessly.

We make a small hole in the dam perhaps 1-20 the diameter of the tooth crown. We push the dam over it carrying the debris ahead of the dam. When we reach the most vulnerable spot in the human body we stop. This—the dental gingiva—is where the most prevalent of all human diseases finds its origin. Having scraped this infection off the tooth surfaces, we force a ligature past the contact down into the septal tissue, tearing the fibers, making an incision, to further the infection, then we tie the ligature there. We lift up the dam and find we have the tissue blanched, the blood, nature's only means of fighting the infection, is driven out, and we ask the patient to sit there until the infection is made sure.

Prepare the Teeth.

Prepare the teeth over which you wish to place the dam, by spraying with warm germicidal solution. Scrub with cotton and paint with weak solution iodin.

Boil the Rubber Dam.

Use six inch dam, in six inch squares, and boil it in your sterilizer. Dry it between sterile napkins and when dry sprinkle boric acid, or talcum powder on it. This will renew the soft velvety finish.

Don't Use Ligature.

Don't use ligature except where excessive decay compels you to do so. Use clamps cautiously, and then only where conditions make them imperative. Pass the ligature gently.

Sit Down.

Now that we have the dam applied, have a comfortable chair for each yourself and assistant and sit down.

Hold the Filling During the Entire Operation.

With the left hand use an assisting instrument during the entire operation. This accomplishes three things. When we start the filling with cohesive gold, it obviates cutting such deep convience pits. It holds the tooth firmly in its socket, preventing the pumping in and out as the stepping of gold is being done. Holding the fillings firmly in this manner saves the patient much discomfort. Lastly it gives greater density to the gold. The tooth held firmly will give greater density to the gold without increase of the hand or mallet force.

Articulation.

We have been making many errors in our operations involving the occlusal and incisal surfaces. One error is to trim them to comfort at time they are made. Another is to leave them over full and require the patient to use until they finally adjust themselves.

If those operations in the bicuspids and molars are ground to comfort at time they are made the patient is robbed of part of his articulating surface. They are never right until the teeth exfoliate and this they may never do. If left too full the tooth must move to secure articulation, and the contacts, as well as the investing tissues, are disturbed and injury may result. Best results can be secured only by a "working bite." When the patient is asked to close he registers one position only and that is a conscious bite. When he bites his food he does so unconsciously, and by this unconscious working we wish to secure our articulation.

The human mouth is the only correct articulator.

The filling is therefore left full and the patient is requested to return every few days. Those places showing where the filling is striking too hard is easily shown and trimmed at intervals until a splendid articulation is secured. This method should also be followed in the anterior teeth.

Do Not Over-Polish Occlusal Surfaces.

Close examination of the unworn occlusal surfaces reveals a surface not highly burnished or polished. It is designed to hold the food as it grinds and cuts it. If this surface is over polished it does not functionate. All other surfaces should be highly polished. The occlusal surfaces should be smooth and sanitary, and true to form, but never highly polished. The best occlusal surfaces are secured by small fine grit stones.

Cohesive Gold Only Should be Used to Restore Occlusal Surfaces.

Soft, unannealed gold has splendid advantages in the gingival third of approximal cavities and in deep occlusal, but should not be used to restore occlusal *surfaces*. True tooth form cannot be reproduced with soft foil. Even were we able to build the incline planes, pits and fissures of the soft gold it would be too soft to stand the wear.

Adaptation to Cavity Walls.

We believe it is apparent to any thinking mind that better adaptation to cavity walls may be secured with gold foil than any other material. Indeed, gold foil is the only material with which we may use to our great advantage the elasticity of the dentin. Dentin is one of the most elastic substances known and with gold foil we are able to spread the dentin and secure a permanent gripping of the tooth on the filling, thus securing an admirable adaptation of the gold to the cavity walls unknown in any other filling material. We thus secure a joint that is impervious to moisture, preventing the entrance of bacterial organisms, preventing tooth discoloration, and giving to the dental pulp the greatest possible protection.

Sterility of Cavity Walls.

Doctor Black laid much importance to sterility of the cavity walls. The saliva is the most highly infected fluid of the body and when the cavity walls become accidentally infected by it, he advised cutting an entirely new surface with the chisel. When the cavity is prepared under sterile conditions, gold foil offers an ideal material with which this sterility may be maintained. The gold fresh from the flame in a most completely sterilized condition is placed at once against the dry, fresh, sterile walls and wedged securely to adaptation. A sterile material wedged securely against

sterile walls, excluding all moisture and bacteria, is perhaps as nearly ideal as we have yet attained.

Securing Separation as We Build the Filling.

No other filling material offers this very convenient feature. This of course can be employed only where a limited amount of separation is necessary. When a considerable degree of separation is necessary the Perry mechanical separator should be employed. But where, as in the ordinary case, a small amount is required, the gold is all sufficient.

Hardness and Wear Resistance.

It is well to mention that malleted cohesive gold possesses high specific gravity and is very hard and wear resisting. It offers, therefore, the best protection to the enamel margins afforded by any of the filling materials. It offers a surface second to none in its resistance to occlusal wear. And we know of no other material, save porcelain, with which a more enduring proximal surface and contact point may be made.

Restoring Tooth Form.

Last, but not least, cohesive foil is the king of filling materials with which the very valuable tooth forms may be most beautifully reproduced. In the restoration of the normal occlusal forms this material works most beautifully. The grooves, pits, incline planes, and cusps are easily reproduced with small pellets using the various plugger points as the operation is built up and finished. No more beautiful forms are possible in inlays or amalgam than may be made with this wonderful filling material. The other surfaces, and forms so vital to physiological function, are likewise as easily and positively reproduced.

It is not the purpose of this essay to condemn the porcelain or gold inlay. Both the direct and indirect methods hold many possibilities. We should dislike to part with them in our practice. We are not in any sense condemning the use of amalgam. We consider it a valuable material and we would not want to practice without it. This is what we do wish to emphasize: That gold foil is not a "lost art" but when properly understood will rapidly come to its own. Already the disgraceful results of easy slip-shod methods are becoming apparent. Interest everywhere is becoming aroused for safer, saner and surer methods.

Gold foil offers a surer and safer, method in a wide range of cavities. Gold foil technic should be thoroly mastered in our colleges, demonstrated in our societies, taught in our study clubs, and more generally employed in our offices. We have not gone into the technic for manipulating gold foil. That is a long essay itself.

Discussion.

E. T. Darby, Philadelphia, Pa.

I have been much interested in Dr. Prime's paper and if for no other reason than because it is good doctrine for you younger men to listen to and it surely will not hurt us older ones. I just said to Dr. Prime as he passed me "that is good sound doctrine and that we taught fifty years ago." The tribute he has paid to Dr. Black is well deserved. I am pretty familiar with Dr Black's character and work and no one values more highly what he has done for the dental profession and for operative dentistry in particular than I. What Dr. Prime has said of the value of gold foil for restorations is excellent. We have been somewhat lead away by its plastics. We have felt that by their use we could save ourselves the hard work incident to filling teeth with gold and then, too, we have recognized that the harmonious color of the silicate cement has been another reason for their general use. But while all this is true, I am convinced that none of the plastics have filled the bill as near

as gold. The only fillings which have lasted thirty, forty and fifty years are of gold.

We older men remember with what enthusiasm Drs. Atkinson and Vooney, of New York, and Marshall Webb, of Philadelphia, and Allpont, of Chicago, and McKellops, of St. Louis, and scores of other men boasted that they could save any tooth with gold that could be saved at all.

I have heard McKellops say more than once, "I will give anyone a thousand dollars who will show me an amalgam filling made by me." The amalgams of his day were so poor that I wonder not that he refused to use them. Dr. Prime has advocated in his paper the use of the stool, and I can endorse all the good things that he has said of it.

Thirty years ago I had a bad fall from a horse which proved a most serious accident. My spine was injured, my knee was injured, and I was compelled to sit at my work and what seemed almost a hardship has proved a blessing. I have found that there are but few things that one does at the chair which cannot be done with the same ease as when standing, and the relief which one obtains from the ability to rest the various muscles is beyond belief to those who have not tried it. One does not need to take the feet from the floor, but simply sit on the edge of the stool and the spine is greatly relieved. Try it for a month.

Dr. Bonnell, of Philadelphia, and Dr. Sheppard, of Boston, were great advocates of its use and hundreds of men who formerly thought it a fad have adopted it with the greatest satisfaction.

George D. Sitherwood, Bloomington, Ill.

I do not rise to take much of your time; but it does seem that a paper of this kind is especially beneficial to the younger men. I was delighted to hear Dr. Prime read a paper of this kind, because I am sure it is very timely.

I left the practice of medicine and became a dentist largely to please a beautiful woman whom I had married, a good many years ago. I had paid a dentist at that time ten dollars for inserting a gold filling in an upper molar tooth for my wife. In a few weeks the filling fell out. I believe I paid him five dollars more to reinsert a gold filling. In a few weeks that gold filling fell out; being somewhat of a mechanical turn, I looked at the cavity and said, "Any man ought to be able to pack gold in a cavity like that."

I then turned my attention to dentistry, and in 1876, a dentist in Bloomington, Illinois, where I was living, visited the Centennial Exposition in Philadelphia. He left me in his office for a few weeks. My brother-in-law came in, and he had a large cavity in a lower molar tooth. I said, "I have seen a dentist pack gold in a tooth. I believe I could pack gold foil in your tooth so that it would remain." That was in July 1876. I put on the rubber dam, and I packed gold foil into that lower molar tooth, and the filling is there yet. (Applause.) It has preserved the tooth, and it has never had any attention since.

Frequently a patient returned to me who has been absent in distant lands for 25 or 30 years, with a great many good gold fillings remaining intact that I had placed there before they left, and they call my attention to that fact.

What is the meaning of that? It is simply that gold foil as a filling material does in a certain sense, as the essayist said, surpass every other.

Dr. Darby alluded to Dr. McKellops. I have been in Dr. McKellops' office several times in St. Louis during his lifetime, and I was very well acquainted with him. If there was any other man who surpassed him in gold fillings, which he could make, I never met him I was once traveling with him on the Illinois Central Railroad and I said, "How large a fee did you ever receive for putting a gold filling in a tooth?" "One

hundred dollars," he said. That was something new to me, to learn that a man could get a fee of $100 for placing a good gold filling in a tooth. These fees were frequently received from actors and actresses who in those days went to Dr. McKellops to have their teeth treated, because of his great skill.

The point I make is this, in reference to gold fillings. It is largely a case of manual skill; and that point that the essayist made about holding the fillings, I remember very well the filling I have spoken about, the first one I ever put in, in order to hold the gold foil I used a small pointed instrument to hold the gold as I packed it in, and it remained.

There is another good point I take it the essayist did not bring out with reference to gold foil fillings, altho he did in a sense allude to it. That is, building up the cusps and reshaping the tooth as it ought to be. There is no material to my mind in the building of those occlusal surfaces of the molars and the bicuspids that surpasses gold foil. The inclined plane should be not toward the approximate surface but away from it. The inclined plane naturally is toward the center of the tooth, you thus get the grinding mill effect in the mouth. To my mind there is not anything that surpasses the gold foil in making that nice adjustment of contact points on the proximal surfaces, so that food does not crowd between the teeth.

There are many things in this paper, but to the younger men I wish to say this, that of all the fillings that I have placed in many teeth none for service or wear surpass the gold foil fillings. Of course, I do not allude to the esthetic effect. Dr. Darby has brought that out very well indeed, but there are many places where you can place gold foil fillings that are not visible, as in the bicuspids and molars, on the distal and occlusal surfaces. We should certainly give more attention to a paper of this kind because it fills its place, with all our porcelain, amalgam and synthetics, gold inlays and all the rest of them, the gold foil filling has a place; it is comparatively easy and should be highly commended; I wish again to compliment the essayist upon the fine paper which he has presented.

James M. Prime, (closing discussion); I expected to have a good discussion here. I am disappointed You men do not all believe this. If you don't believe it why don't you say so? Do you know what the apostle Paul said to the young man he was teaching? He told him he must be prepared to give a reason for the faith that was in him. Are all of you men making gold foil fillings? Let us be free to state why we are doing it if we are and also why we do not practice it and why we do not believe in it.

A Member: Will you ask all who are using gold foil fillings to stand up?

Dr. Prime: Some might think that is too personal.

(However, all those members who are using gold foil fillings were requested to arise, and most of those present arose.)

Dr. Prime: Boys, I want to congratulate you. I am certainly pleased to see so many here using the King of filling materials. Have I the right to inject new stuff that has not been brought out in the discussion?

The Chairman: Technically not, but we will give you the right to do so.

Dr. Prime: Thank you, Mr. Chairman. Dr. Darby said, "That is fifty years old." I answered, sure it is; and that is the reason why I believe in it. If it was fifty days old or fifty weeks old or fifty months old, I would not want to risk it in my patient's mouths. I would not feel so sure.

First, I would like to disabuse your minds of the idea that gold foil is difficult work. If you will give to gold foil

a thoro test and study it thoroly and sincerely and honestly as you do other filling materials, you will be surprised to see how it will grow in your favor, and you will employ it more and more in your work.

The great difficulty with all of us is, we are not sufficiently skillful in employing all the different materials. If you were going to farm and raise various kinds of grains upon your farm, would you buy a corn cultivator only? Would you plant your alfalfa with a corn plow? And would you cultivate your potatoes with a press drill? Would you plow your wheat with a stirring plow? Would you plant your rice on dry, arid land and sow your wheat in a swamp? (Laughter.)

We need all of these materials in the practice of operative dentistry. The man who confines his efforts to gold inlays only is not living up to his possibilities; (Applause) and the man who employs gold foil only,—(in all kindness I say it remembering those dear gold foil workers who have gone before us,) is not living up to his possibilities.

We need an inlay where an inlay is indicated. We need an amalgam filling where an amalgam filling is indicated, and we need gold foil every day. (Applause.)

A hundred dollars for a filling, and they got it a long time ago! If an operator could earn one hundred dollars for filling a tooth with gold foil then what is it worth now when a dollar buys what fifty cents would then?

Here is dear Dr. Darby, honest, sincere, successful, loved as much as any man in our profession, who stands before you in his declining years, an example of a man who does gold foil operations even in the face of physical infirmity from accident, and who has lived so many years.

When they tell you, you will kill yourself in doing gold foil operations, don't believe it. You can kill yourself eating apples. You can kill yourself doing a lot of things if you do not do them properly. You can practice operative dentistry and do all you ought to do, serve as many patients as you should serve, make as many operations as you should make, and live your entire lifetime, if you do it properly.

If you overdo anything in dentistry you will shorten your life.

In the matter of building forms, I have an illustrated lecture on that. It takes me an evening to give it. I enjoy it immensely. How I do like to sit down in my chair and have a patient in the operating chair, the chair padded with pillows and have a pillow in my own chair, where I can reach the cavity and sit in a comfortable position True, some cavities are difficult to reach in the sitting positions. I do not think I could sit in a chair and extract and do every other sort of operation, but you will be surprised how many you can do while in that position.

Building teeth to their natural forms with gold foil is the most fascinating work we do in operative dentistry. If a cusp is not tall enough, put some more gold on it. Do not build it over full and then grind it out. It is such a waste of nerve force and of time, it is such a waste of gold and it is so irritating to your patient. Build the tooth as you desire it.

Study the occlusion before you apply the dam. Take your instrument and lay it across the cusps of the teeth and determine the height you wish to build it. Do this gauging before you remove the undermined cusp. Then lay the instrument back as you build your cusp and it will give you your landmark.

Then with your own judgment, which you will develop to a wonderful degree, lay the inclined planes. How beautiful they are and what wonderful material with which to restore contact on the proximal surfaces.

Replying to Dr. Sitherwood, who so

kindly said the splendid things about my essay, I desire to criticise one point only, and that is this: It is an error to attempt to correct difficulties by raising high sharp mesial and distal marginal ridges.

The form of the tooth as Nature gave it to us, determines the form we shall restore. Nature says, as it were, the food shall go away from the contact point only and provides for the escape into the embrasures. To illustrate this fully it would be necessary to refer to my illustrated slides.

So much is said about the contact point; and what is it? Simply where two teeth properly formed and posed, touch each other. And then, if we have the tooth in its position and restore its form, there is no argument about the form of the contact. It resolves itself into the problem of being able to reproduce those beautiful forms which we find in Nature, and if there is anything I am called upon to do in my profession that is sublimely agreeable and pleasant to me, it is to have a beautiful patient with a beautiful set of teeth, that desires to have those conditions in the mouth restored, presenting for instance, an upper bicuspid tooth with a small area of decay on the proximal surface; it is the sweetest thing that I know of to sit down in a chair, prepare the cavity and to build the tooth to the form that the infinite Maker designed it should have. (Applause.)

You say, "why use that soft foil?" Use soft foil in the gingival third for this, if no other reason, that by removing it you can almost "tease" it out with the little gold knives and files. You are working close to the cementum, and almost on the septal tissue, and they are so important. Be careful and do not wedge great quantities of filling materials down and crowd them into the septal tissues, because when once destroyed it is seldom restored. Treat it with respect. Lay your gingival margin where you can have access to it, put your cylinders in there and pack them down. When you get your filling all complete, with the little files and knives, which are provided, the gold works off so easily before you know it, and your explorator shows that you have a splendid margin. For the sake of the cementum and for the sake of the septal tissue, use soft foil. Then, for the sake of better adaptation to the cavity walls, use soft foil, and for the sake of your patients and for the sake of yourselves and to secure dispatch in the doing of operations, use soft foil.

SAINT APOLLONIA---THE PATRON SAINT OF DENTISTRY.

By Henry A. Kelley, D. M. D., Portland, Maine.

EVER since I have known that dentistry had a patron saint I have been interested in her and have from time to time gathered material germain to the subject. Among the legends in regard to this saint is one that a portion of her jaw, that was beaten out of her by stones by the infidels in their attempts to make Apollonia forswear Christianity, is now in the church at Saint Anne de Beaupre.

On a recent excursion to Quebec I made a visit to Saint Anne and you may be sure that one of the things that drew me thither was to see this portion of the jaw of Saint Apollonia. I made a brave effort to locate this piece of jaw but not being a French scholar and French being the "official" language at Saint Anne, I was unable to find it. I am very much afraid it either is not there or else is not accounted among the valued possessions of the church.

Upon my return home, I concluded to gather together the material I have and present it to the dental profession. In my search for material I have been aided by my friend, Mr. Charles G. Marrett, and the pictures I show I have obtained mostly from friends who have traveled abroad and have been on the outlook for pictures of Saint Apollonia for me, knowing I am interested in the subject.

An article on Saint Apollonia appeared in the July, 1913, number of the Dental Brief. This article, however, has many inaccuracies and I also believe I can add much to the subject. Dr. Koch, in his History of Dental Surgery, refers to this Saint and a painting of Saint Apollonia was presented to the Philadelphia Academy of Stomatology by Dr. C. N. Pierce in 1900. So far as I know these are the only references to Saint Apollonia in our dental literature.

For centuries before there was any dental profession, men and women suffering from toothache had been accustomed to call upon Saint Apollonia to come to their assistance. Poor mortals, that was about all they could do, for a medieval toothache was a pretty hopeless affair. If Apollonia declined to help you, you might try a charm, or go upon a little pilgrimage, but in the end you would probably be quite speedily reduced to the drastic remedy of extraction, and be forced to hunt up some one with a pair of forceps or tweezers—the barber, surgeon or the blacksmith. Extraction could have been no laughing matter in those rough days. Wise and wealthy people saved up their toothaches till the day came round for one of the great annual fairs or markets, and then had their decayed stumps harvested, amid a blare of trumpets, by artists in gorgeous costumes. On such occasions the victim would be further enheartened by a large and interested concourse of spectators.

But perhaps the best thing to do, if Saint Apollonia refused her aid was to seek some monastery and ask the good brothers to take your tooth out. They were usually willing to do so, if ap-

proached in the proper spirit. They kept up this tooth pulling practice, too, into quite recent times. Not so very many years ago, if we happened to be on the Capitoline Hill at Rome on one of the proper days, we should have seen a gloomy band of men, women, and children toiling up the long, steep stairs to the portals of the church of Santa Marie in Araceli, not barefooted or on their knees, but with swollen, aching cheeks, done up in cloths or hankerchiefs, which would be tied in large disconsolate bow knots in a way no longer the fashion for pedestrian toothaches. On the upper step a squad of Franciscan friars, forceps in hand, awaited the sufferers, and there on the crest of Araceli's marble staircase, the populace of Rome, amid much unrestrained and hearty screeching, were wont to have their teeth out at the expense of the church.

On the whole, Apollonia does not seem to have done her duty very well. Teeth are tolerably scarce in Christian history. Even such an exquisite as King Henry III of France at the height of his fascinations did not possess a tooth to his name.

We find there are two Saint Apollonias; a real one, as historic as Queen Elizabeth or Julius Caesar, and no handsomer; and a legendary one, all youth and grace and loveliness. And it is the latter the artists painted, and the toothache patients invoked. Altho so far as she goes the real Apollonia is extremely authentic, we have only a few details concerning her. We know that she lived in Alexandria, and that on February 9th of the year 250, during the persecution of the Christians ordered by the Emperor Decius, she was cruelly tortured by having her teeth knocked out, and then was burned to death. As everybody knows, one of the chief authorities for the history of the early Christian Church is the Ecclesiastical History of Eusebius, Bishop of Caesarea in the fourth century. If we turn to book VI, chapter 41, of this work we shall find there a letter from Dionysius, Bishop of Alexandria, written to Fabius, Bishop of Antioch, which gives an account of the Decian persecution at Alexandria, and also tells us all we really know of Saint Apollonia. Since it is her only historical document, we will quote the portions which relate to her:

"The persecution with us did not begin with the imperial edict, but preceded it a whole year. And a certain prophet and poet excited the mass of the heathen against us, stirring them up to their native superstition. Stimulated by him, and taking full liberty to exercise any kind of wickedness, they considered this the only way of showing their piety—to slay us. First, then, seizing a certain aged man, named Metras, they called on him to utter impious expressions, and as he did not obey, they beat his body with clubs, and pricked his face and eyes; after which they led him away to the suburbs, where they stoned him." The letter then relates how they also maltreated and stoned a woman named Quinta and continues: "Then with one accord, all rushed upon the houses of the pious, and whomsoever of their neighbors they knew, they drove thither in all haste, and despoiled and plundered them, setting apart the more valuable of the articles for themselves; but the more common and wooden furniture they threw about and burnt in the roads, presenting a sight like a city taken by the enemy. They also seized that admirable virgin Apollonia, then in advanced age, and beating her jaws, they broke out all her teeth, and kindling a fire before the city, threatened to burn her alive, unless she would repeat their impious expres-

sions. She appeared at first to shrink a little, but when suffered to go, she suddenly sprang into the fire and was consumed." That is all our actual knowledge of Saint Apollonia and it is surely sufficiently pathetic and deplorable.

She was promptly canonized, and took her place among the noble army of martyrs, but one can readily guess that "an admirable virgin in advanced age" would not be so popular with painters and writers of religious poetry and afflicted devotees as something younger and more romantic. Therefore, it is not surprising that "the admirable virgin in advanced age" grew steadily younger and more beautiful in church tradition and ecclesiastical art, and as she grew more attractive, her story became more elaborate. Here it is in its revised and accepted form:

There lived in Alexandria during the first half of the third century a very opulent magistrate of unknown name. He had married a wife whom he loved devotedly, and who loved him fondly in return. The only blot on the happiness of this pair was the fact that they had no children. They addressed earnest and unceasing prayers to Juno, Ceres, Jupiter, all the gods, to grant unto them a son or daughter to inherit their vast wealth, but all without avail. Three pious pilgrims arrived in Alexandria, and went from house to house asking alms in the name of the Redeemer and the Blessed Virgin, his mother, for they were tired and hungry. The magistrate's wife, seated at her window one day saw them, and heard their petition at a house across the way. Her interest was aroused by their strange words, and she called to them saying: "What sort of begging is that of yours, and who are the gods in whose name you ask?" Wherefore the pilgrims told her of Christ, His life and teaching. And she asked them if the Virgin Mary would hear her if she prayed that a child might be given her, and the pilgrims replied that the Virgin would be gracious to her without any doubt. Then the wife of the magistrate fell on her knees and prayed long and fervently to the Holy Virgin, and her request was granted and a daughter was born to her, to whom she gave the name of Apollonia.

The child grew into a maiden as lovely and graceful as a flower, and as good and pure as she was beautiful. The family of a Roman magistrate quite naturally conformed to the established religion of the state, but the mother never ceased to talk to her daughter about the wonderful circumstances of her birth, and about Christ and the Holy Virgin to whom she had addressed her prayers. Apollonia drank in all the details, and as she got older there sprang up in her heart a strong desire to be baptized and become a Christian. And Heaven did not leave her helpless. An angel came to her one day and led her out of Alexandria into the desert to the cell of Leonine, a disciple of Saint Anthony. Apollonia told him her story and her wish to be a Christian, and Leonine baptized her forthwith. Hardly had he done so than another angel swooped down from Heaven, and throwing a garment of shining white about Apollonia cried: "This is Apollonia, the servant of Jesus; Go, now, to Alexandria and preach the faith of Christ."

Apollonia returned home filled with ecstasy and zeal. She went among the people and preached to them with wonderful eloquence, making many converts. Before long complaints concerning her and her doings began to pour in on her father. Why did he, a Roman magistrate, allow his daughter to break so flagrantly the laws of the Empire?

Illustration No. 1.

Saint Apollonia by Carlo Dolci. This picture hung in the Corsino Palace in Rome in the room in which lived and died Queen Christina of Sweden.

He, much disturbed, called Apollonia to him to explain her conduct. She defended herself with dignity and fervor, and still kept on with her preachings and conversions, until her father, beside himself with anger, gave her up to the Roman governor to be dealt with as a criminal. The governor ordered her to be taken into the temple of one of the pagan gods, Serapis, most likely, and bade her fall on her knees before the statue of the deity and adore it. Apollonia flatly refused to comply. She advanced haughtily to the statue, made the sign of the cross, and commanded the demon inside to depart. There was an awful rumble, a crash, a shriek, and from the broken image the demon fled, crying: "The holy virgin, Apollonia, drives me forth."

This proceeding served to send the governor into a fit of violent wrath. At his bidding the girl was bound to a column, and one by one her beautiful teeth were all pulled out with a pair of pincers. Then a big fire was kindled, and, as Apollonia persisted in her faith, she was flung headlong into the blaze, and there gave up her soul to God, being borne to Heaven by His angels.

Even in the guise of a lovely and romantic maiden Saint Apollonia never attained great vogue. When one compares her to some other female saints—Cecilia, Catherine, Agnes, Lucia, Agatha, Barbara, Margaret—and thinks of all the multitude of churches and chapels which have been reared to them in many lands, and the hundreds of paintings of them which fill the galleries and ornament the altars of the world, Saint Apollonia's light seems but a dim one indeed. Apparently, the only people who have cherished her and her memory to any extent, have been those with toothaches. They were told or read of her sufferings, with her teeth, and relied on her sympathy for theirs. The following prayer is published in F. Martinez's book on dentistry published in Valldolid, Spain, in 1557:

Illustrious virgin martyr, Apollonia,
Pray to the Lord for us
Lest for our offenses and sins we be punished
By diseases of the teeth.

(Translation.)

Another ancient prayer is the following: "Eternally omnipotent God, for whose honor blessed Apollonia, virgin and martyr, steadfastly suffered the horrible crushing-out of her teeth, grant Thou as we desire, that we may be made happy in commemoration of her, thru whose most pious intercession we were freed from toothache and all imminent evils. Through Christ our Lord. Amen." There is also an amusing dialogue in Cervantes' Don Quixote (published in 1615) as follows:

"Be in no pain then," replied the bachelor, "but go home, in Heaven's name, and get something warm for breakfast, and on your way repeat the prayer of Saint Apollonia—if you know it." "Bless me!" replied the housekeeper, "the prayer of Saint Apollonia, say you? That might do something if my master's distemper laid in his gums, but alas! it is all in his brains." There must have been millions of these toothache devotees thru the long centuries, but they seem on the whole to have been an ungrateful lot, for once their pain stopped or their teeth were out, they evidently quite quickly forgot their patroness.

There was once in Florence a convent dedicated to Apollonia, but it was long ago secularized and is now devoted to some military purpose. Only its refectory remains intact. There one can see a small gallery of paintings, but Saint

Illustration No. 2.

Portion of interior of the church of San Maurizio in Milan showing the partition wall separating that part of the building open to the general public from the portion reserved exclusively for the worship of the nuns and the convent. The Altar piece is not by Luini but everything above it and on either side is his.

Apollonia does not figure on any of the canvases.

The pictures of this saint are few anywhere. Mrs. Jameson in her Sacred and Legendary Art names those that were known to her, and few things escaped the keen eyes of that indefatigable English lady, but strangely enough the Saint Apollonias we know best and think most of, she does not mention, while most of the paintings on her list, which is a short one, have since her time by reason of sales and many shiftings hidden themselves irretrievably from the gaze of the ordinary tourist. Mrs. Jameson saw a Saint Apollonia by Hemlinck—where she does not say—one by Furini in the Rinuccini Palace at Florence, one by Granacci in Munich, others by the same artist in the Academy at Florence, and lastly the saint's martyrdom by Procaccini in Milan Cathedral. But pictures have been of late years much bandied about by art critics, shuffled and dealt about so extensively among artists, that what was called a Furini or a Granacci in Mrs. Jameson's time, may nowadays circulate as an Allori or a Bugiardini. Palaces and their contents have been so bought and sold that the migrations of paintings have been many and extensive. There are, nevertheless, two or three Saint Apollonias which can be easily found and enjoyed.

Go to Rome, cross the Tiber, and in the Trastevere quarter visit the big Corsini Palace which stands just across the street from the Farnesina where Raphael painted some immortal frescoes. This Corsini Palace was in other centuries the home of various lordly papal nephews, Riarii, Corsini, etc. Within its walls in 1689 died that most curious and unpleasant female, Queen Christina of Sweden, the Roman Catholic daughter of the great Protestant champion, Gustavus Adolphus, the Christina who preferred men's clothes to her ordinary female attire, who found being queen a dull business and so gave up her throne, who murdered her lover Monaldeschi at Fontainebleau, who refused to comb her hair oftener than once a month and at last would not comb it at all, and clapped upon her head a mothy brown wig like Dr. Johnson's. Now, on the walls of the rooms in which this eccentric lady lived and died, hang the pictures of the Galleria Nazionale of Rome, and among them is Saint Apollonia by Carlo Dolce (Illustration No. 1) in the artist's customary over sentimental manner. Carlo's saint is a very pretty girl, but is not impressive or convincing as a Christian martyr. Dionysius of Alexandria would surely never recognize in her "the admirable virgin of advanced age," who, for her faith leaped into flames of fire. Her head is thrown back, her eyes are raised with languishing glances to Heaven; one hand is pressed against her bosom, in the other she holds tight, in a pair of forceps, a very perfect tooth. But we refuse to believe for a minute that this tooth is hers. Look at her! she has not lost a single one.

One Artist has painted Saint Apollonia to perfection; that is Bernardino Luini, who lived a hundred and fifty years before Carlo Dolce, and did his best work during the first quarter of the Sixteenth century. Bernardino Luini was the most celebrated master of the Lombard school. He was born at Luino about 1465. He is one of the five great painters whose "supremacy" Ruskin names. Upon this always graceful, always tender, always lovely painter fell some shreds from the mantle of his great master, Leonardo. Saint Apollonia may well rejoice that she found such an artist to portray her, for having once be-

Illustration No. 3.

Detail on **LEFT** of High Altar as shown in Illustration No. 2.

held her as Luini has depicted her at Milan and Saronno, you feel an affectionate interest in her, tho you may not be a dentist, or even have a toothache.

Most beautiful of all Saint Apollonias is she of San Maurizio on the Corso Magenta at Milan. There is a bit of history connected with her and her charming sister saints. Early in the Sixteenth century a family of the name of Bentivoglio were lords of Bologna. Bologna belonged by right to the Popes, as did Ravenna, Forli, Rimini, Perugia, and many other cities of Central Italy, for several hundred years before, Pepin, King of the Franks, had conquered the Lombards and handed their cities over to Rome. But the hand of the Papacy had often been weak, its temporal authority defied with impunity, so that in the course of time, ambitious wealthy families had gained the control of affairs in most of these cities and ruled them as their own. Such were the Polentani in Ravenna, the Malatesta in Rimini, the Baglioni in Perugia, and the Bentivogli in Bologna. Toward the close of the fifteenth century and the beginning of the Sixteenth, there came to the Papal throne a series of strong, able, warlike Pontiffs bent upon wresting these cities from the hands of the usurping lords. Such were Sixtus IV, Alexander VI, and Julius 11. The last, a fierce old warrior priest succeeded in ousting Giovanni Bentivoglio from Bologna, and sending him in full flight to a place of safety. Giovanni found a secure refuge in Milan, then at the height of its glory under the Sforza dukes. Florence itself, under her munificent Medici, could hardly vie for magnificence and culture with the Milan of Duke Ludovico Il Moro, to bask in whose sympathetic patronage, architects, artists, sculptors, and men of letters hurried from all Italy.

Giovanni Bentivoglio turned quite naturally to Duke Ludovico for help and a haven, since his wife was of the Sforza family, and his son, Alessandro, had married another of the house. Giovanni was now well on in years and in declining health. Nevertheless, he was reluctant to surrender Bologna to the Pope, and sent his son, Alessandro, to France to try to win Louis XII to the Bentivoglio cause. Alessandro was entirely unsuccessful in this attempt, and while absent in France, his father Giovanni died. They buried him in the church of San Maurizio quite close to his habitation, a church often called the church of the Great Monastery, because attached to it was a big convent for nuns with many buildings and extensive gardens. Some years later the beautiful daughter of Alessandro Bentivoglio took the veil and entered the convent of San Maurizio as Sister Alessandra. Of course the interest of the Bentivogli in this establishment was now great. The church had become ruinous; an architect named Giovanni Dolcebuono was commissioned by the convent to rebuild it, and Alessandro Bentivoglio, the deprived Duke of Bologna took upon himself the burden of decorating the interior of the edifice where his father lay in his tomb, and where his daughter was to worship every day as a nun. He summoned to him a painter whose name just then was golden in Milan—Bernardino Luini—and bade him cover the walls of the new building with frescoes, and Luini painted on the walls of San Maurizio some of his most delightful works.

Every stone of the Great Convent has been swept away; streets of close set buildings now cross and recross the site of the gardens where Sister Alessandra used to walk, but the church still remains intact, a thing of beauty. It is

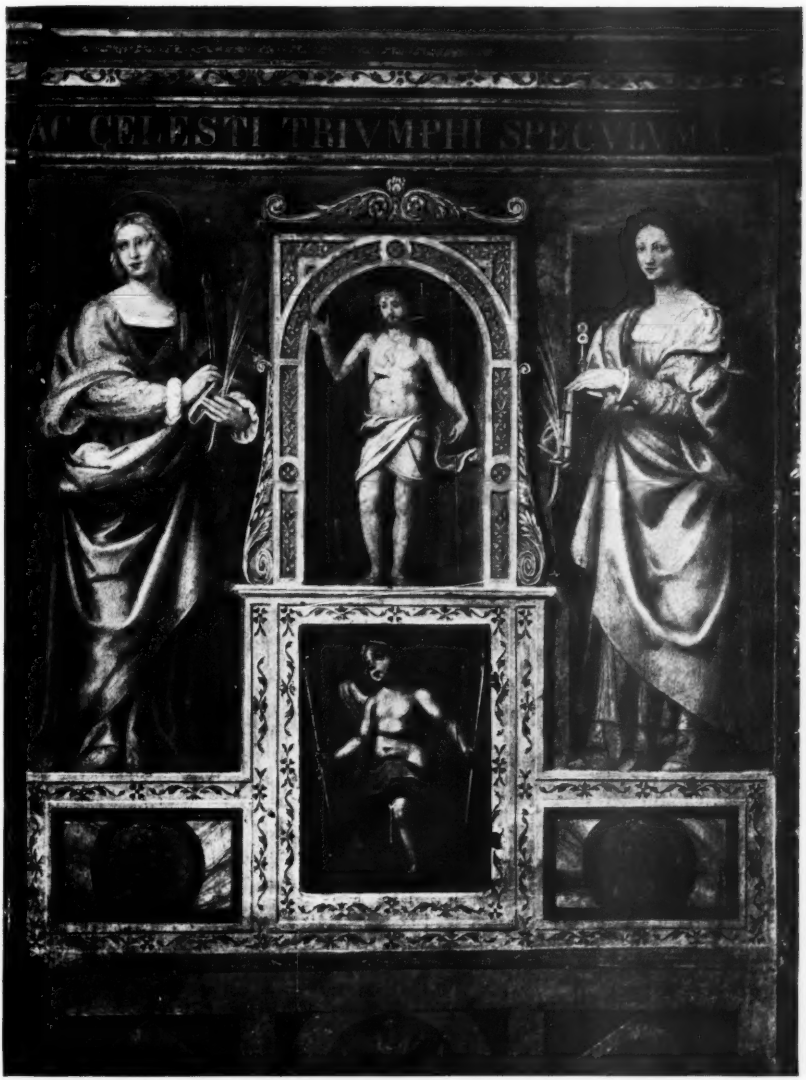


Illustration No. 4.

Detail on RIGHT of High Altar as shown in Illustration No. 2.

rather like a large hall than a church, for it has no side aisles, only a series of flanking chapels. Every inch of the church is covered with frescoes; walls, ceiling, galleries, chapels; and most of them are from the hand of Luini. But we are not in search of Luinis. We are after Saint Apollonia, and we shall not have much difficulty in finding her. This is a nun's church. Therefore, midway of it, a partition wall rises almost to the vaulting, separating that part of the building open to the general public from the portion reserved exclusively for the worship of the nuns and the convent. It is on this partition wall against which stands the High Altar, that we discover the great Luinis in all their gay, clear colors, and their serene beauty. The altar piece is not by Luini, but everything above it and on either side is his. (Illustration No. 2.)

Look to the left, first, (Illustration No. 3.) We see let into the wall the tabernacle in which the Blessed Sacrament is reserved. On either side of it stands a saint. Such saints as would grace any paradise. Saint Cecilia has her head crowned with roses, Saint Ursula is crowned with a golden diadem, for she was a royal Breton princess; a sword is thrust into her breast. Above the tabernacle, within a semicircular lunette (Illustration No. 2) kneels Alessandro Bentivoglio, the donor of the frescoes, magnificently arrayed in his ducal robes. He holds his missal reverently in his hand, and about him stand three saints; Saint Benedict with long white beard—for this Great Convent is a Benedictine foundation; and the two Saint Johns, the Baptist and Evangelist, perhaps placed here in compliment to Alessandro's father, Giovanni. The Baptist has his little white lamb along with him.

Now turn to the right side of the altar (Illustration No. 4.) In the place corresponding to that occupied by the tabernacle on the opposite wall, is a figure of the Risen Christ. Beside him stand two other saints, sisters in sweet sanctity to Cecilia and Ursula. One of them is Lucia, with her two tortured eyes stuck into a sort of sharp bodkin; the other is Apollonia with her forceps and tooth, and a book,—for she was a teacher—and also her martyr's palm. This Apollonia is certainly a figure of dignity and beauty worth going far to see. In the lunette above, (Illustration No. 2) a lady kneels, plainly a great lady, for look at her sumptuous robe of white brocade that sweeps and billows about her, and swells into more than ample sleeves. This is Alessandro's wife, Ippolita Sforza. A Benedictine nun stands hovering over her, a white dove perched on her shoulder. This nun pretends to be Saint Scholastica, the sister of Saint Benedicti, but she is young and pretty, and is in reality none other than Sister Alessandra Bentivoglio, daughter of the kneeling Ippolita. These two ladies are supported by Saint Catherine with her wheel, and Saint Agnes with her white lamb, which balances very neatly the lamb of the Baptist across the altar.

If you pass thru this partition wall into the nun's church, back of it you will find preserved on that side, about the nun's High Altar, other life size figures of saints, and among them another fine Saint Apollonia. (A copy of this picture could not be obtained.)

In the year 1525, Luini while in Milan accidentally killed a man. The details of the affair are not known, but the artist fled from the city pursued by the officers of the law. Some thirteen miles north of Milan on the road to Como is a small town called Saronno, nowadays famous for a certain sort of gingerbread called Amaretti. In Saronno was a pilgrimage church dedicated to the Virgin, and known as the Sanctuary of the Holy Virgin. It possessed the right of sanctuary for crimi-

Illustration No. 5.

Saint Apollonia by Luini. This picture is on the choir wall in the Sanctuary of the Holy Virgin in a small town in Italy called Saronno.

nals; once inside the sacred bounds no constable or bailiff could touch them. Here Luini not only found a safe refuge, but employment as well, for the monks set him to work to decorate their choir walls, paying him thirty cents a day, together with a daily portion of food and wine. This seems to us niggardly remuneration for a Luini, but he was apparently amply satisfied, for he not only covered the choir and its chapels with scenes from the life of Mary, but before he left this asylum he painted for the monks as a gift, a Nativity, which was so beautiful that the good brothers exclaimed it was a pity Luini did not murder more men. This Nativity has vanished from Saronno, but we can still see Luini's scenes from the Virgin's story on the choir wall, and, besides these, in the choir apse are two charming life size figures of saints, one of them Saint Catherine, the other Saint Apollonia. (Illustration No. 5.)

If we had not already been to San Maurizio we should think no Apollonia could be more sweetly beautiful than this one who stands here gently contemplating us, the forceps and tooth in one hand, the palm of martyrdom in the other. Her golden hair ripples down from beneath a sort of turban, appropriate to an oriental saint. She is quite as lovely as the Milan Apollonia but lacks her majesty.

Saint Apollonia did not wholly perish from the earth when the fires of Alexandria consumed her body in the year 250. Fragments of her head and teeth were rescued from the ashes by devout disciples, and today her relics are scattered thruout Europe; stray bits of her have even reached America. Her head is in the ancient Basilica of Santa Maria in Trastevere at Rome, Cardinal Gibbon's parish church or titular, for every Cardinal has his own church in the Eternal City. Her arms are in another old Roman church, Saint Lawrence, outside the walk; and part of her jaw is preserved in San Basilio also in Rome. There are teeth or pieces of them in churches at Naples, Volterra, Bologna. Antwerp, Brussels, Malines, Liege, and in five different churches in Cologne; and on this side of the Atlantic, as I have said, the celebrated pilgrimage church of Saint Anne de Beaupre, near Quebec, is said to possess a portion of her jaw.

She is not needed now, this saint of Egypt, as in those hard old days of yore, but let us hope her relics are not entirely unvisited. Doubtless many a remote or pious toothache she still helps to cure. Surely it should not be difficult for any man or woman, with or without a toothache, to offer up a prayer or two to a saint of such gracious, gentle, charm as the Apollonia of Bernardino Luini.

EXPERIMENTAL PYORRHEA.

By Percy R. Howe, A. B., D. D. S., Boston, Mass.
Assistant Professor Dental Research Harvard University.
Chief of Research Forsyth Dental Infirmary.

(Read before the National Dental Association at Its Twenty-Second Annual Session, Chicago, Ill., August 5-9, 1918.)

IN THIS paper I wish to take up with you, those experiments in which the various theories upon Pyorrhea have been put to the actual test of their ability to produce the disease.

It may be objected by some that the conditions that I shall describe are not true pyorrhea. Pyorrhea alveolaris is a loose expression, but I shall employ it in its broadest sense and consider as pyorrhea, lesions about the teeth that result in the destruction of their supporting tissues. This definition is meant to include all types, and all stages, of this disturbance. The attempt to refine the term "Pyorrhea," often tends to obscure the main principles that underly the trouble. This, it is most desirable to avoid.

There are certain conditions that produce in man such pronounced loss of the supporting tissues of the teeth that they need no more than be mentioned. One of these is phosphorous poisoning. Here the teeth lose their supporting structures and are destroyed. Arsenic applied to the gums destroys the tissue, resulting in loss of the teeth. Mercurical poisoning acts in the same way. These are strong chemical poisons and their effects are most marked manner upon the tissues about the teeth. The alveolar structure which is enscaffold upon the true bones of the maxilla is prompt to show such deleterious effects.

Destruction of these tissues may be brought about by a small rubber ring being allowed to work its way into these tissues. Hasty and improper regulating has been known to produce the same effect. The trauma of irregular articulation is so well known that by some it has been thought to be the sole cause of pyorrhea. Tartar by its constant accumulation becomes a foreign irritant to the tissues and acts to cause irregularity in the natural functions of the soft tissue and also to induce absorption of the alveolar process. But these are mechanical effects which disturb the circulation of the divesting tissues and which cause their disintegration. These effects are marked and self-evident and experimentation could add but little, if anything, to our understanding of the process. Thruout all the literature upon the subject of pyorrhea these are known and accepted ideas.

But there are other theories of pyorrhea that need further study. One of these is the very striking idea that oral endameba are the cause of pyorrhea and that emetin is a specific for the disturbance. (1) To one that has observed these protozoa it must be evident that the conception of their being an etiological factor in pyorrhea is certainly fascinating. These endameba have long been known, altho little previous attention had been called to them. When this theory was first evolved I took the position that oral endameba were nonparasitic and were in no way to be compared with the endameba histolytica of tropical dysentery.

Undoubtedly the originators of this

theory had the parasitic properties of the histolytica in mind when they declared that the oral endameba were the specific cause of pyorrhea. I have found oral endameba in every description of mouths and have written fully of this elsewhere. (2) I carried out the following experiments. I established pockets about the teeth of guinea pigs and sealed in as well as possible active endameba. Only spontaneous healing occurred.

Craig (3) has done extensive work upon the endameba in man. He terms the endameba of the mouth endameba gingivalis. He says concerning them that the "size varies from seven to thirty-five microns, the average diameter being from twelve to twenty microns; ectoplasm and endoplasm well developed, the ectoplasm being visible only when motility is present. The ectoplasm is quite refractive and movement is quite active, the pseudopodia being well developed and short and blunt, or long and finger-like in shape. The endoplasm is granular, contains very numerous food vacuoles, non-contractile, but in the living specimen a distinct nucleus is not visible in most instances. The organism is actively phagocytic and red blood corpuscles are often ingested. Reproduction apparently occurs only by simple division during the vegetative stage of development. Cysts are formed containing one neucleus, but no reproductive phenomenon have been observed. The cysts measure from eight to ten microns in diameter, altho larger cysts have been observed in the human mouth. It also occurs in a large proportion of perfectly healthy mouths and there has never been the least proof adduced, of an experimental nature, connecting endameba gingivalis with the production of pyorrhea."

I had the pleasure of examining at Paris the specimens of Dr. Chiavaro of Rome, and to find that he agreed with me in his opinion of their office in the mouth. He states that they are harmless scavengers engaged in the auto-disinfection of the mouth. After this theory began to be generally questioned, I discussed the matter with Dr. Smith and he suggested that they might still be factors in pyorrhea thru toxin formation derived from symbiotic relationship with bacteria. There seemed to be no reason to support the idea, indeed it was highly theoretical and in the experiments upon guinea pigs there was no evidence to support it. I believe the endamebic theory has been practically given up.

The theory that pyorrhea is caused by bacterial invasion is, of course, the most prominent at the present time. That bacteria are always associated with pyorrhea is beyond question. No specific bacterium has been found, but a great variety of microbic life is present. What is the nature of this bacterial flora? What is its source? Does it become parasitic, if so how does it become parisitic? Is it the first cause or is it secondary are questions upon which we need further light.

In considering this it is necessary for us to know the types of micro-organisms found in pyorrhea and something of their action in tissues Many of the reports upon the bacteriology of pyorrhea have been based upon smears. (4) The objection to be raised against smears is that many micro-organisms are very pleomorphic. Indeed, all micro-organisms appear in different forms during different stages in their life cycles. They also react to different staining reactions according to the media in which they live. On the other hand cultivation upon artificial media is not without its draw-backs for certain micro-organisms grow rapidly in one culture media and not so well in another. Some do not grow at all. The living together of various types of micro-organisms, or the symbiotic relationship, is rarely represented in the culture tube. So that it is difficult to obtain an exact

representation of what goes on in the mouth. Nevertheless, no specific bacterium has so far been found. The following microbic life has been reported. The ameba, which we have already discussed; spirochetes of various types, such as treponema mucosum, have been cultured and studied. Treponema mucosum is a mucin-former and gives the characteristic odor of pyorrhea (Noguchi.) (5) From smears other spirochetes are given, as S. refringens. S. vincenti. These Drew and Griffin (6) differentiated by the Congo-red method. Streptococci, of both the viridans and hemolytic type, many cocci, staphylococci, both albus and aureus, catarrhalis, teragenus, vibrios, fusiform and other bacilli, all have been mentioned.

In my cultural examinations, I have found spirochetes and have cultivated them in horse serum, staphylococci, streptococci, both short-chain green-producing colonies and hemolytic streptococci, bacillus bifidus, (7) colon bacillus catarrhalis. These were cultivated aerobically and anaerobically principally on blood agar.

In thirty cases by the Avery method and by the Avery, Chickering, Cole and Dochez (8) method, I have found pneumococci but once. This was type IV. Goadby (9) remarks that he has found no pneumococci in pyorrhea. Others have reported the opposite. In the case containing type IV the material was placed into type 1, 2, 3, anti-pneumococcus sera furnished by the Rockefeller Institute and into bile. They were soluble in bile and gave no reaction in the sera which indicates a type IV pneumococcus. The source of this material was from a very bad case of pyorrhea.

In nine other cases the material was drawn from the pyorrhea pockets by means of sterile pipette, cultured for five hours in 4 c. c. of blood broth. Cells were thrown down, then the microorganisms in the supernatant liquid decanted and thrown down, 2 c. c. sterile salt added and these were injected intraperitoneally into 15 gram mice with no result. Mice are alive and well.

In ten other cases the same proceeding was used except the cultures were incubated.

In twelve cases the material from the pyorrhea pockets was injected directly into mice, for it was thought that some of the micro-organisms that would not grow in culture media might grow in the body of the animals.

TABLE.

Case No.	Weight of Mouse	Dose	Effect
21	1.7 grams.	1.5 c. c.	none
22	14.7 "	1 c. c.	"
23	16.8 "	1 c. c.	"
24	12 "	1.5 c. c.	"
25	8.7 "	½ c. c.	"
26	17.4 "	¾ c. c.	"
27	22.6 "	1.1 c. c.	died 27 hrs.
28	14 "	1.6 c. c.	"
29	13 "	1 c. c.	"
30	14 "	1.5 c. c.	"
31	18.5 "	1.5 c. c.	"
32	19.9 "	1.5 c. c.	"

For dosage we have in this table an average of 1.2 c. c. to a 15.8 grams mouse. Only one of these mice died. Examination of the peritoneal washings showed staphylococcus infection with colon bacillus. This may have been due to intestinal puncture, but this rarely happens and we have found staphylococcus and colon bacillus together in an examination of pyorrhea pockets.

However, this shows that in the majority of cases that the virulence of the organisms of pyorrhea pockets to mice at least is low, for this dose mentioned above would amount to about five and a quarter liters injected in the case of a man of seventy kilos or of one hundred and fifty-four pounds, while in a mouse of 15 grams weight one one-millionth of a cubic centimeter of virulent streptococcus will produce septicemia and death. In injecting mice with these massive doses intraperitoneally two deaths only have occurred. One showed type IV pneumococci the other staphylococci and colon bacillus. In a colony of 15 mice, four untreated mice died. Goadby (9) on the contrary injected subcutaneously ten guinea pigs and five rabbits with an emulsion of pyorrhea pus in sterile broth. All but one guinea pig and one rabbit died. He does not give his dosage.

It is well known, however, that such micro-organisms are as a rule low in virulency. It is also known that they constitute the usual oral flora of the adult. And that it is only under certain circumstances that the tissue looses its natural refractory state toward them and is invaded.

I have injected some of these micro-organisms into the tissue about the teeth of guinea pigs but have never been able to establish in this way any condition that stimulates pyorrhea. Nothing but spontaneous healing has occurred.

Dr. Hartzell (10) in his very interesting studies says, I believe, that he was never able to produce a dental abscess by injection of streptococcus viridans. So far as I know no one has yet been able to produce pyorrhea by the injection of micro-organisms, or any mixture of micro-organisms about the teeth. As regards the participation of bacteria in pyorrhea alveolaris, Miller (11) says, "Micro-organisms which possesses pyogenic properties temporarily or permanently inhabit every mouth. If, therefore, *the power of resistence* of the peridental *tissue be impaired* by any of the above mentioned local or constitutional causes in such a manner as to furnish a suitable culture medium for the bacteria. They will, of course, begin their ravages and the usual symptoms follow." That is, the tissue alteration is the first cause. The bacterial invasion is secondary. In view of what I have shown this seems to me the only possible explanation of the part played by the microbic life in this lesion. There is an enormous amount of evidence to support such a principle and so far as pyorrhea is concerned none that I know of that will support any other, viz, that the infection is secondary.

The infection must be proceeded by chemical or mechanical tissue disturbance; by trauma; by constitutional effects due to nervous, or anomalous metabolic conditions.

So far as ameba is concerned no tissue effect is to be seen. As for the spirochetes of the type under consideration Noguchi says that they will not grow in healthy tissue. He regards the etiological factor in pyorrhea as an anomalous metabolic condition, the infection as secondary. The study of the fusiform bacillus in pyorrhea and other lesions by Dick (12) and others (13) (14) show it to be secondary. And so it is with the other micro-organisms of pyorrhea so far as is known.

If the infective part of pyorrhea is a secondary matter in its pathology and if the infection consists of a mixed flora

what must be said concerning the use of vaccines in its treatment?

The most we can expect from the use of a vaccine would be to produce an effect upon the sequelae of a previous disturbance. Vaccines as they are ordinarily prepared for pyorrhea are prepared from aerobic cultures This is one limitation, for it would only produce its effects upon the aerobic organisms of pyorrhea, while a great proportion of the micro-organisms of pyorrhea are anaerobes.

Vaccines for use in this connection are prepared by short time cultivation. Such preparations would not have any effect upon the micro-organisms that are most intimately connected with the process, if we are to judge by the effect upon the media in the culture tube. I refer to the mucin-forming and media-liquifying spirochetes for these micro-organisms require from eight to ten days or even longer for development. Vaccines might affect the staphylococci. With regard to the streptococci upon which an immense amount has been done, we can only say that much more remains to be done. The streptococci are usually classified as those that have the property of producing methemoglobin from oxyhemoglobin and those that do not. Pneumococci possess the same property. (15) This is the basis of distinction between the streptococcus viridans and the hemolytic streptococci. There are certain discrepancies in this classification as are continually being shown. Howel (16) says, "No correlation was observed between complement fixation tests and groups based on hemolysis and nonhemolysis." Vaccine and serum treatment has not been considered effective in this connection by the majority of workers upon the subject. (17) (18)

So that there seems to be little reason to feel that vaccines would be effective in pyorrhea. On the whole, then the beneficial results to be expected from vaccines must be limited. The infection may be disposed of surgically or it may be effectively treated by injections of substances like mercury succinimid. (19)

The experimental condition that stimulates pyorrhea most closely is that brought about in guinea pigs by feeding them milk and oats or some constipating diet. In about three weeks the teeth loosen, the gums bleed and the joints are affected. In some animals the teeth have become so loose that they could be removed with an excavator. In certain cases the teeth will tighten upon giving a cathartic. This has been shown by McCollum and by Pitz (20) (21). Jackson and Moody (22) (23) and others have studied this experimental condition from a pathological and bacteriological standpoint. I have carried out this experiment on several batches of guinea pigs with special reference to this very pronounced dental effect. The guinea pig has a delicate caecum and when this becomes impacted thru an improper diet the teeth loosen and a joint affection occurs. Some have suggested that this tooth and joint condition might be an infection. However, this may be the control lies within the intestine as Pitz (21) has shown for by adding 10% to 20% lactose to the diet of grains, the guinea pigs improve. It prevents the formation of such intestinal putrefactive substances as, indole, scatole and phenol. He attributes the condition to the pasty feces of the oat diet and to the resulting toxemia. This condition is known as experimental scurvy and its study presents some most important dietetic material for the student of dental conditions. Upon improper diets the laboratory animals become the victim of many low grade infections. Indeed, Pemberton (22) says, "that cases showing unmistakable and obvious sources of infection in teeth, tonsils, or elsewhere may improve or recover completely upon a dietary regime.

The character of foods in the control of dental disturbance is undoubtedly a matter of great importance. Particularly in the growing child. This experimental pyorrhea is only one of the noticeable effects. McCollum (21) and Mendel and Osborne (23) have shown how it is possible to check or to induce growth or fecundity, by a proper or improper diet. The effect upon maternal nutrition and in turn upon the offspring have been demonstrated beyond question (24). The need of milk and of the leaves as well as the seeds of vegetation for a full dietary requirement is pointed out. McCollum's water soluble B. and fat-soluble A. are most important factors in this connection. The dental effects of a correct dietary requirement remain to be more fully studied. The dietary effect can be seen in the loosening teeth of the experimental scurvy. All our knowledge of caries points to an unbalanced diet, perhaps a deficient diet together with other factors. Pemberton has noted the effect in other low grade infective processes and McCollum in his experiment has noticed and commented upon the same thing.

I should like to speak of tartar formation in this connection, for I believe it is fully as much a constitutional matter as a local one, but the space for this is too limited. Dr. Black's experiment of fastening a cover glass to his teeth and noting that with over feeding he obtained a deposit upon it demonstrates a step in this same direction. I have spoken of the effect of nutritional balance (25) upon the character of the saliva elsewhere as well as upon the character of tartar and its mode of formation. (26).

We know that as a rule pyorrhea is a disease of the adult. We know that house-fed dogs have it extensively. We know that it accompanies certain diseases or irregular metabolic states, such as diabetes, alcoholism, syphilis. One of the heads of one of our large hospitals has said, "that all his patients have it." It follows disturbances of the glands of internal secretion. It follows chemical and mechanical trauma. As a rule oral conditions are directly dependable upon an infinite number of systemic changes. This is the undeveloped field for study and of the greatest importance to the student of the pathology of the mouth. Anyone can extract teeth but to save them according to the accepted surgical teachings of the day is our problem. Remove all diseased processes surgically. Endeavor to keep up the resistance of the tissues by every known method. Recognize pyorrhea early. Attack the disturbance in its initial stages. Stay the teeth during treatment if necessary. Remedy irregular articulation. Replace missing teeth. Observe all hygienic measures bodily as well as local and the treatment of pyorrhea will be successful.

TABLE.

1. Bass and Johns, Jour. A. M. A., Vol. LIXIV, No. 7.

2. Howe, Percy R., Dental Cosmos, April, 1916.

3. Craig, Chas. F., Jour. Med. Res., Vol. XXXV, No. 3.

4. Hecker, F., Am. Jour. Med. Science, Vol. CXLIX, No. 6.

5. Noguchi, Jour. Expt. Med. Vol. XV, No. 1,

6. Drew and Griffin, Jour. of the Royal Microscopied Soc., April, 191—.

7. Howe and Hatch, Jour. Med. Res., Microscopied So., XXXVI, No. 3.

8. Avery, Chickering, Cole, and Dochez-Monograph, No. 7, Rockefeller Institution for Med. Res.

9. Goadby, The Mycology of the Mouth.

10. Hartzell, Jour. Nat. Dental Ass'n.

11. Miller, The Micro-organisms of the Human Mouth.

12. Dick, Geo. F., Jour. Inf. Dis., May, 1918.

13. Worster, Drought-Cecil, British Dent. Jour., Vol. XXXIX, No. 12.

14. Gibbs, J. H., Edinburg Med. Jour., 1917, No. 19.

15. Frances G. Blake, Jour. Expt.-Wed., Vol. XXIV, p. 315.

16. Katherine Howell, Jour. Inf. Dis., March, 1918, Vol. 22.

17. Nicol, Jour. of M. A., 1914.

18. Heinemann and Gatewood, Jour. Inf. Dis., 1912, X 416.

19. Wright and White, U. S. N. Med. Record, March, 1915.

20. Jackson, Leila, Jour. Inf. Dis., May, 1918.

21. Pitz, W., Jour. Bio. Chem., Vol. XXXI, No. 3.

22. Pemberton, Am. Jour. Med. Science, Vol. CLI, No. 3.

23. Osborne and Mendall, Jour. Bio. Chem., Vol. XXXIV, No. 1.

24. McCollum and Simmonds, Am. Jour., Phy., June, 1918.

25. Dental Cosmos, 1911, p. 43.

26. Proc. Sixth International Dental Cong., London, 1914.

27. Hall and Harvey, Jour. Med. Res., Vol. XXXV, No. 3.

22. Jackson and Moody, Jour. Inf. Dis., 1916, No. 19.

14. Cozier, Dental Cosmos, June, 1917.

Discussion.

A. W. Ward, San Francisco, Calif.

I suppose that you all are as well pleased and highly gratified with this paper of Dr. Howe's as I was; yet there are some things that the Doctor has left us in the dark about; as, for instance, concerning immunities. Of course, that is something no one knows very much about; but the Doctor speaks of the susceptibility of the mouth of the guinea pig to pyorrhea following a certain diet, which would lead us to believe that perhaps the human being might also become infected with pyorrhea, due to a faulty diet. That is a possibility. But to me it is hard to conceive of any one, living as we normally do, where we can choose our own foods getting pyorrhea from a faulty diet.

I have had under my care thousands of cases of pyorrhea and I have never seen a true case of pyorrhea caused by salivary calculus. I have seen deposits of calcareous matter. I am speaking now of a calculus. I have seen such products of salivary calculi on the teeth that they became a mechanical irritant, forcing the tissues away, until they finally fell out, but I have never seen a true case of pyorrhea caused by salivary calculus, and I do not think they are. Most of them are caused—I agree with Dr. Howe—by mechanical disturbances.

He speaks of the spirochetes and the fusiform bacilli. Pyorrhea in many cases begins very very early, very often by roughened enamel, allowing a lodgment for bacterial placques containing the bacteria that cause suppuration. Too often I believe dentists all over the world look for pus in pyorrhea. There is not microscopic pus in one case in six of what we call pyorrhea. We understand pyorrhea as a destruction or a breaking down of the entire investing material, of the socket of the tooth. And yet very often this destruction goes on for years with no visible external significance. I mean to say there is no irritation of the gums apparent. There is not any pus. You have your patient under your charge all the time.

Some day an infection by a pyogenic micro-organism takes place, and the patient, to your astonishment, comes in, displaying a great deal of pus in the mouth, and you say that this patient got a case of pyorrhea since you saw him last, when a radiograph of the mouth would have shown that the investing material had been breaking down for years, unknown to you.

Speaking of the mercurial treatment that we recognize, the deep injection of the succinimate of mercury into the gluteal muscles, it is hard for me to understand in this day how a thing of that sort could be recommended. The very thing in syphilitic cases that causes pyorrhea or pyorrheal conditions is not the spirochetes. It is the mercury that has been given along with the treatment for the condition.

There is one thing more. It seems so odd to me, when the Doctor speaks of these hospitals filled with patients suffering from arthritis and from all sorts

of diseases, that any one could conceive in the face of that evidence that these diseases were not caused by the constant absorption of bacteria for years and years, and that it would be expected that as soon as this secondary condition was eradicated, that the patient would get well immediately.

It is not inconceivable when you consider that twenty bacteria can walk abreast on the edge of a razor blade, that a loose tooth, we will take for instance, an upper molar, where the lingual root is entirely denuded of this tissue, where there is always pus present—I said it was not always present but I mean microscopically it is not proved. We know that microscopic pus is present in all of the breaking down of the osseous tissues. The loose teeth act in the way of a syringe, forcing the bacteria directly into the blood stream. Is it not almost inconceivable when we consider as I say that twenty streptococci can walk on the edge of a razor blade, and that these bacteria have been forced back into the blood stream for from five to twenty years, how a scientific man could expect that upon the removal of the teeth the patients would get well immediately. They don't.

The eradication of the foci in the mouth is the biggest step in medicine today. I do not believe that the great advance that is expected from us is going to be brought about by any drugs at all. It is going to be brought about by good surgery, good root surgery, and good bone surgery. You can never hope to inject any sort of a drug into a human being's arm or into their back or anywhere else and remove the seruminal deposit, two-thirds down the length of the root. The only way to do it is to get in and dig, and learn to do good root surgery. (Applause.)

H. J. Leonard, Minneapolis, Minn.

Dr. Howe's paper fills a long felt want in the hearts of many of us at the University of Minnesota. In the clinic on pyorrhea, we have been brought up on the theory of streptococcus invasion, and that has not answered all of our difficulties. We have often felt that streptococcus invasion was a secondary consideration, and that cleaning up the root surfaces and treating the gums by massage was merely treating symptoms and getting only at secondary conditions.

This consideration of diet, putting the patients health on the standard of proper hygiene, seems to me to be a fundamental consideration in the treatment of pyorrhea, and the quicker we can get ahead of disease of the gums as well as the sequelae and concommitant conditions in the joints and elsewhere, by putting our patients on a proper hygienic dietary regimen with proper exercises, the quicker our patients will be freed from constantly recurring gum and periodontal inflammations.

But there are many other factors, such as loss of teeth, with the subsequent malarticulation that occurs from the shifting of the teeth, that have a great deal to do with the degenerative conditions of the pericementum. It is the belief of many of us who have studied the proposition at Minnesota that the invasion of the gum and periodontal tissues by the streptococcus is due to predisposing causes from systemic mal-metabolism, and local injury from mal-occlusion and malarticulation.

Dr. Howe, closing the discussion: I am very much pleased with what the doctors have said. I heartily agree with it, and if you have noticed carefully what I said, you will see that I advised the very method that the doctor from the West has advocated. I said, "Use every known method of hygiene, local and bodily." Is there any objection to remembering the fact that we have 27 feet of intestine and 5 inches of mouth, and not 27 feet of mouth and 5 inches of intestine? The intestine is a large absorptive tract; we do not want to forget that.

The tissues of the mouth are tough and fibrous.

I cannot go into a discussion of the foci of infection theory at this time and do it justice, but I will say one thing; the doctor said I did not mention immunity. I did not suppose I would be misunderstood on that. The foci of infection theory takes no account of immunity. Man becomes immune to the natural flora of the mouth, and he is immune to his own flora. A horse from the west, east has to become acclimated. He becomes immune to his new environment. You heard General Gorgas tell last night about his being immune to yellow fever, and you have heard about injecting vaccines to make men immune to various things.

The streptococcus theory does not seem to work out properly on a immunological basis. There is something the matter. This is still a subject for broad study.

It is all right for us to proceed on the foci of infection theory and clean up everything, but don't lie down exclusively on that small and limited viewpoint. The human organism with which we are dealing is a very complicated thing and many physiological and biological processes must be considered. I believe the dental profession is going to become a part of the great medical organization. We need to learn a little more about general conditions, before we begin to learn the specific things.

I want to say one more thing. I recognize that I am dealing with animals. I know of course that if you inject an animal in the ear you do not get pyorrhea in the ear. Rabbits are susceptible to streptococci, but cats are not. When I speak of the spirochetes, I am only speaking of a class of organisms, not of the pallida, which is the cause of syphilis; a dose of succinimate of mercury in certain cases has a marked effect—I do not advocate it as a rule but I have seen pronounced results in certain cases. Diagnose pyorrhea early, use surgical means, keep the parts clean, do all you can to keep up the resistance of the tissues, and you are doing much for your patient.

A SIMPLIFIED AND RATIONAL METHOD OF CASTING GOLD INLAYS.

By R. H. Volland, D.D.S., M.D., Iowa City, Iowa.
Professor of Operative Technic and Dental Pathology State University of Iowa.

AN ACCURATELY fitting gold inlay can be made. In order to obtain such an inlay the several steps in technic must be carried out with extreme care. A well prepared cavity with smooth walls and margins that will allow the shedding of a perfect wax pattern without distortion is the first prerequisite. The making of a wax pattern is an exacting piece of technic and must be well done. The treatment of the wax pattern and the final production of a smooth accurately fitting gold inlay is the object of this paper.

Let it be supposed that a perfect wax model has been made and is mounted on a sprue wire. A wax pattern should be invested as soon as possible after removal from the cavity so as to prevent any possible changes in form due to variation in temperature or to accident. A reasonable sized sprue wire is all that is necessary. A victrola needle has been used with complete satisfaction. However, the wire should be of a length that will permit the investing of the model about half way between the end of the ring and the apex of the former. A deep hole in the former and this hole lined with bee's wax will facilitate this adjustment.

A former should be used to insure uniformly good results. The former should provide a positive seating for the ring. Rings of various sizes are recommended but it seems best to use a ring of liberal size. The ring for inlay work should not be less than one inch in diameter. The length of the ring will be determined to a large degree by the height of the cone that forms the crucible. A good working rule is to have approximately as much investment from the apex of the cone and from the end of the ring to the wax pattern as there is on any cross radius from the wax pattern to the inside of the ring. Therefore, if the crucible former is high, a long ring is necessary. The reason assigned for the above specifications is that a sufficient amount of investment should surround the mould to prevent surface or superficial changes of the investment, when on heat, from affecting the walls of the mould. This is especially true if the gold is to be melted in the crucible—as in casting with compressed air, gas or steam. A larger ring —one and one-fourth inches in diameter—is needed for this type of apparatus than for a centrifugal machine where the gold is melted outside the crucible. Many different types of rings have been advocated—thin, thick, iron, brass, bronze, perforated, partitioned, etc.,— but the ring is only a tool for moulding the investment to a convenient form. Perfectly fitting gold inlays can be made without the use of a ring during the heating and casting of the gold. This can be easily demonstrated if a centrifugal machine is used. It is true that a ring is more or less necessary to help complete the adaptation of the plunger in a compressed air, gas, or steam apparatus, but the ring itself has nothing to

do with the fit or misfit of an inlay when the casting is made. A sufficiently large number of experiments has been made by the writer, using a divided ring during the investing but removing it at the time the former and sprue were removed preparatory to putting the case on heat, to substantiate the above statements.

Treatment of the Wax Pattern.

The sprue wire holding the wax form should be placed in the former and adjusted to proper height. The pattern should then be thoroly washed with grain alcohol applied with a small sable brush. The bristles of this brush should be at least one-half inch long and a tuft of at least one-eighth inch in diameter. Such a brush is soft and pliable and in washing the wax pattern there is little danger of bending or distorting any delicate margin of the wax. The washing of the wax model with alcohol removes any oleaginous material and facilitates the flowing of the investment material closely over the pattern.

Investment Materials.

Many different investment material formula have been devised and exploited by dentists and manufacturers. In so far as the writer knows the principal materials used in these formula are plaster of Paris, silex, graphite, etc. Each producer claims to have made a combination of materials that will not distort or disintegrate when heated and therefore help to insure a final well fitting casting. The plaster of Paris is used as a binder for the other ingredients just as cement is used as a binder for the rock and gravel in concrete. Silex is an infusible material and is added to help control distortion of the investment when it is on heat to dissipate or "burn out" the wax pattern. Graphite is added to give smoothness to the walls of the mould when the wax has been dissipated. It is also thought to assist in controlling distortion and in facilitating the adaption of the molten gold to the walls of the mould. This idea, that the presence of graphite, silex or any other material is necessary to control distortion or provide a smooth wall in the mould, is poorly founded. Perfectly smooth and accurately fitting castings are being made by the writer with plaster of Paris alone as the investing material. He has experimented with several brands and formula of investment materials and finds that no smoother or more accurately fitting castings can be made by their use than by the use of plaster of Paris when correctly handled. These findings are not strange when one remembers that the binder of all investments is plaster of Paris. A concrete block will not exhibit its maximum resistance and strength when the binder has been partially or wholly destroyed. An investment loses its desired qualities in proportion to the deterioration of the binder. It is the plaster of Paris of an inlay investment that should receive first consideration and the technic which will be outlined in the following paragraphs will conserve the integrity of the plaster of Paris whether it be used alone as an investment or as a binder of other materials.

Investing.

All materials entering into an investment should be the same temperature as the wax pattern—namely room temperature.

Plaster of Paris—Ordinary good grade medium setting model plaster is suitable with water at room temperature—the plaster should be mixed to a consistency which will allow the following technic to be completed. The wax pattern is given a thoro painting of this mixture, using a sable brush such as was used to wash the pattern. Care should be taken to see that the plaster goes into all irregularities and gives an even coating. This

coating will be very thin. When every particle of surface has been reached by this first painting more plaster can be quickly applied with the brush. The ring is now placed in position and the investment completed either by pouring the plaster directly from the bowl or by carrying it to the ring on the spatula. In either case the plaster should be poured down the inside of the ring on one side. It will flow down the side of the ring over the former, rising over the cone, enveloping the sprue and the wax pattern and finally filling the ring. The plaster of Paris should not be assisted to flow by jarring or tapping. After the investment has reached the wax pattern there is always danger of bringing any air bubbles which may be confined in the mixture up to the wax pattern if any jarring or vibrating is resorted to. These air bubbles which fasten themselves to the wax pattern cause corresponding beads of gold on the casting. If the operator keeps in mind the rapidity with which the plaster of Paris sets and the amount of technic that must be accomplished from the time the mixture is made until the ring is full, he can, with a very little experimenting, determine to what consistency the plaster must be mixed. When the ring is rounded full the invested case should be permitted to stand undisturbed until the plaster has set so that it offers considerable resistence to the finger nail. The surplus plaster should be cut even with the end of the ring and the former and sprue removed. The case should immediately be placed on heat, crucible side down.

Other Investments—The manufacturer or dentist who offers a certain investment to the profession has usually worked out a set of rules for the mixing and applying of that particular product and it may be well to follow such instructions, providing the above outlined technic for investing can be followed.

Dissipating the Wax Pattern.

This process is commonly called "burning out the wax" which is rather misleading. The dissipation of a wax from is accomplished in three ways. (1) Absorption of the molten wax by the investment. (2) Running of the molten wax out into the crucible thru the sprue hole (when the investment is placed on heat with the crucible end down) and (3) Volatilization of the wax. In the treatment of an invested case these three phases work together. They can be accomplished at a temperature that will not materially effect the desirable qualities of a wholly plaster of Paris investment or the plaster of Paris in a combination investment. As soon as the wax begins to melt the porosity of the investment allows the absorption of a portion of it. The absorption of the melted wax is the greatest factor in dissipating it. The sprue hole offers a gate way thru which some of the molten wax may flow. As more heat is applied some of the more volatile elements of the wax pass away as gases. This should be a very minor part of the process as it requires too much heat. The gases developed in volatilization often ignite and burn with a small flame at the sprue hole. The degree of heat that is reached in this latter treatment of a mould is not only unnecessary but detrimental to the quality of the mould.

Plaster of Paris will withstand a dry even heat of 320° F, without deterioration of its desirable qualities as an investment. 300° F is sufficient to dissipate the wax provided it is subjected to that heat long enough. Wax patterns can be dissipated in from thirty minutes to an hour and a half at that temperature. Since wax patterns are variable in size a good working rule is to keep the investment on a heat of between 300° and 320° F for one and a half hours, when the wax will be dissipated and the case may be set off to cool.

Since it is essential to keep the tem-

perature of the investment within rather close limits it is necessary to use something more than an open flame over which to heat the case. The playing of a flame directly upon an investment causes a rapid deterioration and distortion of the plaster of Paris. Most of the deleterious effect is at first confined to the immediate surface of the investment but there is no means of judging how rapidly it is penetrating, so the walls of the mould may be affected before the operator is aware of it.

The case should not be heated too rapidly. The rapid rising of an invested case to a high temperature causes the wax to melt, steam to form, and a series of peculiar wax explosions to take place in the mould. Continued intense heat finally causes the wax to boil. The agitation of the wax due to explosions and boiling works out the particles of silex, graphite, etc., which are not directly held by the binder, from the walls of the mould. A casting made in such a mould comes out with a roughly etched surface. If the heat is sufficient to disintegrate the plaster more particles of silex, etc., are dislodged and a rougher casting results. A rough casting cannot fit a cavity as perfectly as a smooth one. Furthermore too rapid heating may cause the investment to crack and a "feathered" inlay result.

Many devices have been used to assist in carrying out the principles outlined above. A heating arrangement that will best answer the purpose must provide (1) control of the heat, (2) registration of the temperature, (3) prevent the flame or heating unit from coming in direct contact with any part of the investment or ring and (4) a more or less even distribution of the heat all around the invested case. A small asbestos lined oven equipped with a vulcanizer stud and thermometer furnishes a satisfactory appliance. An electric unit or gas flame may be utilized to furnish the heat but a flash plate must be provided to distribute the heat evenly thruout the chamber and prevent the heating unit from coming in contact with the invested case. A vulcanizer can be used with satisfaction. An empty flask should be placed in the bottom of the bowl. The flame of the vulcanizer plays directly on the bottom of the bowl so that it becomes too hot for an investment to rest upon. The empty flask acts as a flash plate. Since no steam pressure is developed the cover of the vulcanizer need not be clamped. Dr. Hollenbeck, of Lewiston, Montana, has devised an electrically heated and controlled apparatus. It is unique and should give very satisfactory results.

If the reader is skeptical concerning the ideas expressed so far and does not care to invest in additional equipment, an empirical method that gives satisfactory results is as follows: Upon a small household gas plate a circle of stove pipe iron large enough to cover the top of the stove is placed. Another piece of the stove pipe metal or tin eight or ten inches high is bent to form a draft shield extending more than half way around the stove. Two or three old burs on the plate will serve to raise the invested case from the hot plate. If the experimenting is done at night or in a dark room the flame should be turned until small areas of dark red appear on the stove pipe metal. The position of the gas cock should be noted so that like results may be obtained at anytime. It requires from one to two hours to dissipate the wax in this comparatively open apparatus as the air currents of the room modify the temperature. In ten or fifteen minutes after the case is put on heat, steam will rise from it. Later smoke may appear from the wax that has run out of the sprue hole. At the end of an hour the ring is grasped with a pair of tongs and quickly tipped. If no further smoke immediately rises the

case is considered done and set off to cool. If smoke immediately rises, on tipping, the heat is continued for fifteen or twenty minutes longer and the same test is repeated. On the completion of this method of dissipating the wax the crucible will be discolored. The discolorization will vary from a light grey to almost black. This last method is purely empirical and while it gives good results the writer does not feel that it is as accurate as one in which a heating apparatus with proper control and thermometer is used.

Casting.

Perfect castings are made only in moulds that have been permitted to cool to room temperature—the so-called "cold mould." A mould that is too hot to be borne comfortably on the back of the hand is a distorted mould and a distorted inlay is the result of casting in such a mould. The hotter the mould the more distortion is present. After the wax has been dissipated and the mould has cooled the casting may be done any time.

There has been much discussion concerning the karat of gold to be used in casting. Excellent casting can be made with 22 K, 23 K and 24 K gold when properly handled. Twenty-two karat gold has many qualities which make it a very desirable material for inlays in most cases. Many operators contend that only pure gold can be used to make accurately fitting inlays. They argue that pure gold has less contraction on cooling from a molten mass to a solidified state than any alloy of gold. Such statements are true. Up to the present time no rational technic has been advocated that will minimize this contraction. The gold should be heated only to a temperature that will permit it to be forced to place in the mould. The higher the temperature to which gold is brought the greater will be the contraction from the molten mass to the solidified state. Therefore, when a mould is filled with super-heated gold the contraction is in proportion to the superheat. It is contended that the contraction together with the maintained pressure used in casting will cause more gold from the surplus in the crucible to enter the mould and make up for shinkage. These contentions cannot be substantiated by practical demonstration and many valid reasons can be given to nullify the arguments. Inlays that have been cast with super-heated gold do not fit the cavity in their long diameters. Operators resort to excessive cavo-surface laps, not bevels, and advocate the burnishing of such laps to obtain what is nothing more than a cobbled fit. Such misfits are especially noticeable at the gingival of proximo-occlusal or still more in mesio-occluso-distal restorations. But a casting that is made with due regard to the technic of this paper will accurately fit a cavity which is prepared according to the principles laid down by Dr. Black. Such a cavity requires only a moderate beveling of the cavo-surface angle.

Many methods of forcing the gold into the crucible are employed. In view of the fact that it is desirable to avoid subjecting the investment to any more heat than is necessary some form of the centrifugal machine is the choice. The gold can be melted outside the crucible so that very little direct heat reaches the investment. Of the centrifugal machines, those activated by a smooth but quick acting spring seem most desirable, because of the almost instantaneous movement of the molten gold into the crucible upon releasing the spring. When gold is heated to a point only sufficiently molten to insure its adaptation to the walls of the mould this conservation of time in getting it to place is important.

Of the methods of casting that require the melting of the gold in the crucible, the simplest form is by use of a wet asbestos pad or "steam method" as it is

named. The process is too familiar to need description here. Satisfactory inlays can be made by this method.

The writer has not carried on extensive experimentation with other machines. The principle objection is the necessity of melting the gold in the crucible and therefore the possible distortion of the mould. If any method that requires the melting of gold in the crucible is to be employed, thicker investments must be provided around the mould. Therefore, larger rings than those used in a centrifugal machine are desirable. In melting gold in a crucible a small pointed flame should be used to concentrate the heat upon the gold. The gold should be melted as quickly as possible. It should be remembered that all moulds start as "cold moulds" in casting no matter what form of apparatus is used.

The question now arises as to what tests can be used to determine how hot the gold should be to make a desirable cast. The ocular test gained by experimenting is about the only guide. Upon first melting, gold tends to assume a spherical form. If heat is continued, it is soon observed that a film breaks on the surface of the sphere and retracts down over the sides, leaving a bright mirror-like surface. If the heat is decreased just an instant this film reappears, giving a dull lusterless coating. Increase the heat and the film again retracts. Gold is hot enough to cast in a centrifugal machine when it reaches the stage when it is covered by that mirror-like surface. It will be light yellow in color. In using steam or compressed air a little more temperature is needed. The gold will have that mirror-like surface but should be a much lighter yellow in color. After the gold has been brought to the desired temperature it should be cast as quickly as possible. The reason is obvious.

The heating of the gold can be accomplished by many ways. In most localities the city gas is of a quality that answers the purpose if a suitable blow pipe is obtained. When gold is to be melted in the crucible, where rapidity of melting is desirable, acetylene, oxy-hydrogen or some other combination may be advisable if the city gas is not exceptionally good.

Recapitulation.

(1) Wax forms should be mounted, washed with alcohol and invested as soon as possible after removal from the cavity.

(2) Wax forms, investment materials, and water to mix the latter should be kept at room temperature.

(3) As soon as the investment has set sufficiently to give a reasonable resistance to the finger nail the former and sprue should be removed and the case put on heat *immediately,* crucible end down.

(4) The temperature at which the wax is dissipated should not exceed 320° F and should be continued one hour and one-half. The investment or the ring should not come in direct contact with the heating element.

(5) The casting should be done in a cold mould. The gold in casting should be raised to a temperature just sufficiently high to permit it to be forced to adaption to the walls of the mould.

(6) A machine that allows the melting of the gold outside the crucible of the investment is preferable.

THE NECESSITY FOR ORTHODONTIC INTERFERENCE IN MALOCCLUSION OF THE TEETH.

By Harry E. Kelsey, D. D. S., Baltimore, Md.

(Read before the National Dental Association at Its Twenty-Second Annual Session, Chicago, Ill., August 5-9, 1918.)

IN THE consideration of this subject there are three attitudes from which it should be viewed; first, that of the laity; second, that of the dentist; third, that of the orthodontist; and while it is true that all three to a greater or less extent recognize the importance, or I might say the absolute necessity for orthodontic treatment where the malocclusion is so obvious as to be apparent to anyone, there are many other conditions which quite as urgently demand treatment but would never get it if left to the judgment of the layman, while there are still others which are much less important from a functional and therefore health standpoint, which because of some slight irregularity in the anterior teeth are regarded as serious conditions by him. A further education of the laity is therefore obviously essential.

Such education should be of two kinds: first, that which will give the patient as wide a comprehension of orthodontic requirements as is possible for them to acquire, which secondly should in turn teach them their limitations in that respect and therefore greater confidence in the opinion of the practitioner in whose hands the child is placed. All orthodontists are familiar with the attitude of some parents who seem to think that the work is to be conducted under their direction, and to a conclusion such as they have reached in their minds is proper and adequate for their child. This generally, of course, consists in having absolutely even anterior teeth, with but little regard to the occlusion of the remainder, and in addition any changes in the child's expression which they consider would enhance its beauty.

If all teeth would remain exactly where they are placed thru treatment, it would put a great strain upon the conscience of many orthodontists to resist the temptation to produce some beautiful even anterior arch sections and leave the masticating portion of the organ, together with the resulting bad effect upon the patient's health, to take care of itself. However, it is too well known that perfection cannot always be maintained in respect to even alignment of the anterior teeth even when the molar teeth are in excellent occlusion, and rarely if ever when they are not. Any layman of average intelligence can understand and in fact usually knows that the various muscles and limbs cannot develop normally if deprived even partially of their function, and in the light of this knowledge it is not difficult as a rule to make him see what he has not generally recognized, namely, that the masticatory and respiratory organs, including the bones, muscles, and other tissues composing them, are in no way different in this respect from the bones, muscles, etc., composing other organs of the body. Furthermore, when properly presented to him it will appear as logical as it is true, that when the function of mastication is not normally performed, every succeeding process of digestion and elimination thruout the alimentary canal is necessarily as much interferred

with as is the development of the jaws and all associated structures, and when you have a patient whom you have made to understand these things, and who desires his health preserved or restored as the case may be, you have a much more satisfactory one than he who is only concerned in the cosmetic effect of your treatment.

The attitude of the dentist I have placed next because he so frequently sees children before the orthodontist and has therefore the earlier opportunity to exercise his judgment in regard to an impending malocclusion. With the opportunity comes also the obligation to warn the parent of the necessity for treatment if it exists, or if there is no well-defined malocclusion at the time, but merely conditions which would lead him to expect it to develop later, it would seem to be his duty to refer the child for an examination by the orthodontist, the rhinologist, or any other specialist whose particular field seems to be having an abnormal influence on the development of the dental organ.

In this connection and without meaning to be critical the essayist would like to refer to the great discrepancy noted everywhere in the advice given by dentists to patients with regard to malocclusion, and especially with regard to the time that treatment should be commenced. Perhaps to the orthodontist the two most discouraging procedures on the part of the dentist is his advice to parents of children to wait until all the permanent teeth are in, excepting of course the third molar, before beginning orthodontic treatment, and his frequent willingness still to sacrifice without much of an effort to save them the most valuable teeth the child will ever have, namely, the sixth year molars, either one or more of them.

I am not beginning in arraignment of the dental profession for this practice, because it does not indulge in it as a profession. No doubt the majority of dentists keep up with the latest thought and opinions in all their collateral specialties, but even if a good majority do, it leaves an unfortunately large minority whose orthodontic advice to the patient reads like a lecture from the operative chair of a dental college of from twenty-five to fifty years ago. Particularly is this true with regard to their advising the extraction of the sixth year molar at about the eleventh or twelfth year in order that the twelfth year molar may erupt in its place.

So much has been written on this subject and read before dental societies that it may seem like bringing coals to Newcastle to reopen it. However, as long as the practice exists it will be necessary for those who believe that it is wrong, to oppose it and endeavor to correct such a fallacious and pernicious principle of practice.

What is perhaps an even more disastrous form of advice that is still occasionally given to parents is referred to by Dr. E. H. Angle in his seventh edition of "Malocclusions of the Teeth" under the caption "Forces Governing Malocclusion." "Recognizing the potency of these influences it must be apparent that cases of this kind instead of being self corrected will become more complicated as time goes on and as each succeeding permanent tooth is erupted. How absurd and unfortunate then is the common daily advice from dentists to anxious parents to let the teeth alone and nature will correct them unaided." Fortunately this advice is much less frequently given than at the time the above quotation was written, but the essayist has met with it within the year. In some instances dentists have observed slight irregularities in erupting teeth where there was yet plenty of room for them, which have gradually come into even alignment as development proceeded, and they have confused with these other cases of true malocclusion which they have failed to recognize as such.

At the recent meeting of the Eastern Association of graduates of the Angle

school in May a paper was presented by Dr. Howard T. Stewart, of New York, upon the best method of restoring missing teeth, particularly in younger patients, whether lost by extraction or congenitally absent. The paper was rather a resume of the opinions of more than a hundred men both orthodontists and general practitioners whom the writer had consulted with reference to the subject. It was notable that tho the opinions varied considerably as to whether the space occupied by the missing tooth should be maintained or be restored if it had already closed up, and an artificial substitute supplied, the absence of the tooth was without exception deplored by all of them, which is significant and encouraging because the men consulted have attained the highest professional standing and their opinions may therefore be supposed to represent the most modern thought along professional lines. If the best minds then in all the professions or specialties of professions whose practice is concerned in the normal development and health of the dental organ agree, as it seems they do, that the loss of a single tooth greatly harms the efficiency of the teeth as a whole, it must be conceded that their opinion is correct, and it only remains for everyone whose practice is in the mouth or adjacent organs the health of which has a direct influence upon the health of the mouth, to familiarize himself with this fact, and then in so far as is possible adhere to it in his practice. Orthodontists are not of those who claim that no tooth should be extracted, for it is now generally recognized that there are conditions involving the general health of the patient which imperatively demand it, but these conditions would obtain less frequently if both the laity and the dental profession in its entirety recognized the serious consequences that must follow the loss of one or more teeth. They would then be much more zealous in watching for and preventing carious inroads upon the structure of the teeth, and particularly would they guard in the mouths of young children the health of the sixth year molar, the tooth so often regarded as temporary by the laity because of its early eruption, but which is nevertheless the most important member of the dental organ as a whole, not only because it is the largest and because of its position in the arch the most effective in mastication, but also from the fact that it exerts a greater influence upon the full normal development of the jaw and all adjacent bony structures than any other of the teeth.

In every orthodontist's practice there are a number of disheartening cases which have come to him after the extraction of the sixth year molar, and in some cases there is evidence of a determination upon the part of the dentist to get those teeth out before the patient consulted the orthodontist, knowing that if he did not, he would be urged by the orthodontist to make renewed efforts to save them until complete development of the jaws had taken place, and while they might have been willing to make those efforts in the case of an adult, they sometimes shirk the responsibility because of the difficulty often encountered in treating children, which leads me to express the opinion that there should be a dental child's specialist in every community large enough to support him.

So much of the convictions of the orthodontist with regard to this subject have been incorporated in the foregoing pages that for a paper of this scope it is probably enough to say that neither he nor his brothers would exist as a profession were there not malocclusions to be treated, and he like most specialists very probably often thinks his field the most important to the health of the individual, added to which is the problem of correcting or improving an unfortunate facial appearance. In other words, in the minds of the orthodontists there can be no question as to the necessity for orthodontic interference where even a

slight malocclusion exists, and for interference by other specialists in conditions or habits which tend to produce malocclusion, thus getting into the even more important field of prevention.

Of course the only discussion that can arise among orthodontists as to the need for treatment in a given case would involve a determination as to whether malocclusion or etiological factors that might produce it were observable in the patient. If they agreed that they were, they would necessarily also agree upon the advisability of treatment for either the malocclusion or the conditions which would induce it.

It may seem that the paper has wandered somewhat away from the subject, but if the profession can once fully realize the harm resulting from the loss of teeth they must just as surely recognize the harm which comes from undeveloped or abnormally developed jaws with the resulting misplaced teeth, for in both instances impaired function of the organ as a whole is the inevitable outcome.

Discussion.

S. J. Rauh, Cincinnati, Ohio.

What proportion of orthodontic interference should be attempted in deciduous cases? It has been advocated among the general practitioners—I am a general practitioner—that we undertake this as early as possible, before the first molar erupts, and I would like to know in what proportion of cases that interference should be applied.

H. E. Kelsey, Baltimore, Md.

If you mean what proportion of malformations appear while the deciduous teeth or most of them are in the mouth, I believe seventy-five per cent. can be observed during that time. The malocclusion as it will be eventually may not be there, but the impending malocclusion will be. Often there may be no irregularity of the teeth at all, merely a lack of development in the arches which points to a malocclusion that will appear later.

As the Doctor has brought up this point I will say that in my paper I should perhaps have touched more fully upon it. Many children have beautiful, even, temporary dentures and the parents are perfectly delighted with the condition of the child's mouth and often escape warning by the general practitioner because he is not aware that by the beginning of the fifth or sixth year if much development and growth does not take place in the arches, as would be indicated by the appearance of spaces between the temporary teeth, malocclusion is bound to occur later on. If this normal development does not take place, treatment should be commenced as soon as the age and temperament of the patient will permit.

S. J. Rauh: You did not get my question. I do not doubt that they should be done, but I wish to know in what proportion of your cases such interference is necessary before the deciduous tooth disappears? For instance, I have seen numbers of cases where the first molar is regular and the second comes in irregular.

H. E. Kelsey: This is a subject of the greatest importance and might occupy hours of discussion, but I will try to give in a few words my ideas on the subject.

I believe that where an abnormal condition exists it should be treated as soon as it makes its appearance. That is the general principle of all medical and surgical treatment. It is impossible to treat a child of two years, and yet they sometimes have malocclusion. I would say that I believe it is proper to treat malocclusion as early as the patient will permit of proper treatment. Patients vary so greatly that one cannot lay down any rule, but I would say from four years up. Some children of five or six can be treated more successfully than a good many of the older patients.

A STUDY OF THE BEHAVIOR OF PLASTER OF PARIS AS AN INVESTMENT IN THE PROCESS OF VULCANIZING DENTAL RUBBER.

By E. H. Mathis, B.S., D.D.S., San Francisco, Cal.

(Read before California State Dental Association, July, 1918.)

AN INVESTIGATION conducted for the purpose of compounding an investment suitable for flasking dental rubber which is to be vulcanized must contemplate the conditions obtaining in the steam retort of the vulcanizer, the behavior of the rubber and investment during the time they are subjected to these conditions, and the physical properties of the investing material prior to vulcanization and after removal from the retort.

The object striven for in rubber plate work is to obtain a true reproduction in rubber of a wax model patterned after portions of the oral cavity, therefore, a true negative of the model upon which the investment is poured must be obtained. This form must be rigidly maintained during the complete hydration of the plaster and thruout the interval of expansion of the rubber in the vulcanizing process. It is imperative that there be a minimum of distortion due to setting, technic of manipulation and the dehydrating action of the superheated steam in the vulcanizer, together with the disintegrating influence of the boiling water. The investment should be so compounded that it may be gauged with cold water and will set quickly, giving a fair reproduction of the surface finish of the model.

The bolted flasks commonly used for vulcanizing dentures demand greater strength of investment than would be required in flasks which can be adjusted to accommodate the flow and expansion of the soft rubber. To meet this requirement a strong plaster mixed with coarse sand is employed as a basis for the investment here discussed.

Source of Plaster Tested: This study of the physical properties of Plaster of Paris has been confined to certain Nevada products, since they are easily and cheaply obtained locally. No attempt has been made to investigate a large number of brands of plaster since such a work would give only relative values and in no way serve to answer the question, "How can the undesirable properties be eliminated?"

Local gypsum varies greatly in its calcium sulphate content and in the nature of the impurities which are incorporated with it, however, the average gypsum may be considered to be 90% calcium sulphate containing variable amounts of calcium carbonate and silica. This fact coupled with the lack of uniformity of finished product due to the calcining methods and the degree of trituration, render it impossible to obtain identical figures from experiments performed upon successive samples of plaster received from the manufacturer, however, relative values obtained from a series of experiments upon a given sample show the same tendencies as similar experiments performed upon another sample of the same type of plaster. Therefore, we may assume the properties emphasized are common to the types of plaster in-

vestigated. It should be noted that the plaster employed has been calcined and then subjected to the grinding action of mullers only and that no impact reduction has been employed in the process of its manufacture.

Observation on Plaster of Paris Under Atmospheric Conditions: In this section will be found a general summing up of the physical properties of the plaster as exhibited prior to being subjected to the conditions obtaining in the vulcanizer. It should be noted at this point that the plasters under discussion in this paragraph contained no accelerating or retarding agent except as indicated and consequently are not influenced by unknown foreign agencies. The term "Water-Plaster Ratio" will be used to indicate the ratio of the weight of water in grams to the weight of plaster in grams employed in a given mix. The following tabulation will show some evidence of the effect of the water-plaster ratio upon the setting time and resultant strength of the model. The degree of trituration is also considered and is shown to exert an influence of considerable importance.

TABULATION NO. 1.

"A" Sample.

Sizing Test		80% thru 200 mesh screen	
	Water-Plaster: Ratio	60-100	48-100
	Time Interval		
Compression Resistance, per sq. in.	45 min.	540 lbs.	820 lbs.
" " " " "	24 hrs.	840 "	1100 "
Tension " " " "	45 min.	110 "	160 "
" " " " "	24 hrs.	135 "	225 "
Expansion (Linear)	45 min.	.22%	.24%
" " " " "	24 hrs.	.33%	34%
Setting Time		20 min.	19 min.

"B" Sample.

Sizing Test		85% thru 200 mesh screen	
With coarse material somewhat finer than the sample previously mentioned.			
	Water-Plaster: Ratio	60-100	48-100
	Time Interval		
Compression Resistance, per sq. in.	45 min.	500 lbs.	780 lbs.
" " " " "	24 hrs.	840 "	1100 "
Tension " " " "	45 min.	110 "	175 "
" " " " "	24 hrs.	120 "	220 "
Expansion (Linear)	45 min.	.16%	.24%
" " " " "	24 hrs.	.25%	.37%
Setting Time		24 min.	18 min.

"C" Sample.

Sizing Test		75% thru 200 mesh screen	
		Coarse	Fine
	Water-Plaster: Ratio	60-100	60-100
	Time Interval		
Compression Resistance, per sq. in.	24 hrs.	770 lbs.	1100 lbs.
Expansion (Linear)	24 hrs.	.25%	.26%

"D" Sample.

Addition of 3½ % of finely ground gypsum to "B" Sample, which is unadulterated Calcined Gypsum or Commercial Plaster of Paris, for the purpose of acceleration, effects a loss of approximately 12% of the compression resistance and increases the expansion 12% of the original figure, making a total

volumetric expansion of about .9%. This material corresponds to impression plaster except that the latter is generally more finely ground. Ammonia salts produce an additional expansion as great as 16% of the original volume change when added in amounts not in excess of .20%.

Records of observations made at five minute intervals, of the expansion phenomenon exhibited by samples of flasking plaster (Plaster of Paris containing about 3% ground gypsum) furnish the data for the construction of expansion curves shown on Plate No. XIX. Referring to this curve of the behavior of the plaster it will be noted that the rate of expansion is quite uniform during the first fifteen minutes of the set. At the forty-five minute interval 50% of the expansion has taken place; the total elongation or linear expansion of the model in twenty-four hours amounts to .28% and the volumetric expansion is .84%.

Expansion Control: In seeking a solution of the expansion problem certain neutral agents were employed such as rock flour, marble dust, clay, ground silica and sand. While these materials in themselves exhibit no expansion or setting phenomena, some of them nevertheless, owing to a certain content of their extremely fine material, serve to accelerate the setting of the plaster with consequent exaggeration of its expansion, therefore the use of finely ground materials was abandoned.

The sand employed was obtained from various localities, Ottawa Standard sand twenty-thirty mesh, San Francisco peninsula sand dune material, San Francisco Bay and Monterey Beach sand, American River Sand obtained near Sacramento, Arroyo Seco sand from Southern California and Yuba River sand taken from a stream near Marysville, were investigated. These fillers were productive of desirable results in some cases but owing to alkali and other salts, silt and excess of water necessary to produce suitable mixes in most instances, the virtues of the plaster were impaired. The salts hastened the set, increased expansion and sacrificed the strength of the resulting model. The Beach, Bay and American River sand appeared to introduce the greatest disturbances as well as being erratic in their action, therefore, the use of these sands was abandoned. The Arroyo Seco sand, while thoroly compatible with the plaster, was discarded on account of the excessive amount of micacious material contained in it. The mica did not mix uniformly and owing to the predominence of Biotite Mica the models appeared smudgy. The Ottawa Sand answers the purpose admirably insofar as compensating for a portion of the expansion, but owing to the uniformity of size of the grains or perhaps to their surface form, the resultant models made from plaster containing 50% of this sand exhibited a loss of about 25% of the original plaster strength. The Yuba river sand was adopted as the most desirable.

Addition of 50% by weight of Yuba river sand to the plaster does not materially alter the strength of the plaster. The small loss in strength of such a mixture is probably due primarily to the excess of water required in gauging the plaster to produce a proper mix, rather than any inability on the part of the plaster to carry the sand. This combination is used as a basis for the investment, and other agents were sought to offset the remaining uncontrolled expansion amounting to a trifle more than one-half of the original distortion.

Certain retarding agents were added to the sand plaster mixture, with results indicating their possible value insofar as the expansion of the mass is concerned, but all of these agents tried reduced the strength of the set material. Borax solutions, hydrated lime, extracts of slaughter house refuse, glue, and gelatinous

materials obtained from the liquors resulting from the hide tanning industries were used in the experiments. The series of experiments with retarding agents is not sufficiently comprehensive to preclude the possibility that some such agent might be employed which would offset the expansion and prove to be satisfactory in other respects.

The negative results obtained by the use of retarding agents suggested the desirability of avoiding organic agents for farther investigation. Mixtures containing Portland cement seemed to offer possibilities. Various brands of this material were secured and incorporated with the same plaster compound in amounts of 1% to 20%. The lower percentages exercise a desirable influence on the compound, but owing to the tendency to accelerate the set of the plaster, a workable mixture could not be made up which would completely offset the remaining expansion. The accelerating influence appears to be due to the degree of fineness to which the cement has been ground and the gypsum which has been incorporated with the cement clinker for the purpose of retarding its set. It was, therefore, necessary to secure ground cement clinker containing no added gypsum. Such material was obtained from several plants and used with more or less desirable results, but the Santa Cruz Portland Cement product proved to be the most favorable material tried, since it exhibited the least tendency to accelerate the mix. The clinker was ground to pass a 200 mesh screen, and added to the sand plaster compound in amounts of 10% of the total weight of sand and plaster together thus reducing the expansion of the mass from .20% to .05% in a mix made up with a 60-100 water-plaster ratio. The water-plaster ratio, it should be remembered, refers to the plaster of Paris contained in the mixture. It will then be evident that the water-investment ratio is much less than this, being somewhat less than 30-100, but for practical purposes the figure 30-100 may be assumed to be correct. Using such an amount of water produces a convenient mix which sets slowly, the time being about nineteen minutes.

As a matter of interest it may be noted that the clinker used which was obtained from the Santa Cruz plant arrived in two shipments, the properties of which were somewhat divergent. The original sample, designated as "A" in tabulation No. 2 exhibited an initial set in fifteen minutes; final set in two hours and twenty-nine minutes; tensile strength of approximately 220 lbs. per sq. inch in twenty-four hours, while the second sample from the same plant obtained some five months later and designated in the tabulation as "B," showed the following properties: Initial set 26 minutes; final set one hour thirty-seven minutes; tensile strength 307 lbs. per square inch in twenty-four hours. The first sample mixed in a 10% proportion with the plaster and sand above noted eliminated all of the expansion except .10% while the second sample which attaines its final set in a shorter time reduced the expansion to .05%. It should be further noted that in seven days the resultant model showed a net contraction of .05% and that in twenty-one days there was no further change apparent. Models made from materials compounded as here described exhibit a smooth and glossy surface adjacent to the wax or varnish model. In fact, such mixes are capable of producing a fair representation of any surface upon which they may be poured.

This material will admit of a fairly wide range of water-investment ratio without serious consequences, tho a ratio of 25-100 to 30-100 is most desirable. It may be poured similarly to a medium or thick mix of plaster. This latter property will obviate the necessity of the tedious packing of dough-like investments now on the market.

Investment material built along these lines is by no means ideal. It is not as resistant as some artificial stone when used for models and does not trim nicely owing to the sand content.

gate. This latter is most important and in a measure explains the increased expansion of mixes which are relatively dry and those which set with excessive speed. Samples offering the greatest

TABULATION OF PHYSICAL PROPERTIES OF SOME PLASTER, CEMENT, SAND MIXES.
TABULATION NO. 2.

No.	R	C	C′	T	T′	E′	Plaster	Cement	Silica			
1	.60		860			.20%	1		1	Ottawa	Sand	20-30 mesh
2	.60		850		170	.12%	1	10%	1	"	"	20-30 mesh, Golden State Cement
3	.60		800		160	.11%	1	10%	1	"	"	20-30 mesh, Medusa (white) Cement (Sets very rapidly)
4	.55		850			.12%	1	10%	1	"	"	20-30 mesh, Medusa (white) Cement (Sets very rapidly)
5	.55		900		170	.10%	1	10%	1	"	"	20-30 mesh, Santa Cruz Special (A) Sets slowly
6	.55		750			.10%	1	15%	1	"	"	20-30 mesh, Santa Cruz Special (A) Sets slowly
7	.55		1150		190	.11%	1	10%	1	Yuba	River	Pass 30 mesh, Santa Cruz Special (A) Sets slowly
8	.55		750		160		1	10%	1	"	"	Pass 30 mesh, Santa Cruz Special (A) Sets immediately (expansion could not be measured)
9	.60	850	1050	155	175	.09%	1	10%	1	"	"	Pass 30 mesh, Santa Cruz Special (A) Sets very slowly
10	.70	600	900	150	165	.07%	1	10%	1	Bay	Development	Pass 30 mesh, Santa Cruz Special (A) Sets rapidly
11	.70	750	800	150	150	.08%	1	10%	1	Yuba	River	Pass 30 mesh, Medusa (A) Sets slowly
12	.60		1120			.10%	1	10%	1	"	"	Pass 30 mesh, Santa Cruz Special (A) Sets very slowly
13	.60	700	750		160	.11%	1	10%	1	"	"	Pass 30 mesh, Santa Cruz Ordinary. Sets rapidly
14	.55		800			.11%	1	10%	1	"	"	Pass 30 mesh, Santa Cruz Ordinary. Sets rapidly
15	.55		750			.11%	1	15%	1	"	"	Pass 30 mesh, Santa Cruz Ordinary. Sets rapidly
16	.60		1200		165	.05%	1	10%	1	"	"	Pass 30 mesh, Santa Cruz (B) Sets very slowly (final set 19 min.)
17	.50		1400				1	10%	1	"	"	Pass 30 mesh, Santa Cruz (B) Sets slowly (final set 15 min.)

LEGEND

R Water Plaster Ratio.
C Compression resistance per sq. in. in 45 minutes.
C′ Compression resistance per sq. in. in 24 hours.
T Tension resistance per sq. in. in 45 minutes.
T′ Tension resistance per sq. in. in 24 hours.
E′ Expansion per cent in 24 hours.

Microscopic examination indicates that expansion is not only due to the larger volume occupied by the di-hydrate than by the half hydrate which produces it, but also the voids enclosed within the crystal aggregates. These voids appear to be dependent upon the shape of the individual crystals composing the mass upon the facility offered for crystals to arrange themselves in a compact aggre-

crushing resistance show the development of long crystals having relatively great area of cross section (Plates Nos. I, II and III.) Models made up of plate-like crystal aggregates, club-like forms, twinned crystals (Plate No. IV) and masses showing radial arrangement of crystals (Plate No. V) offer a much lower resistance to compressive stress than models made up of individual crys-

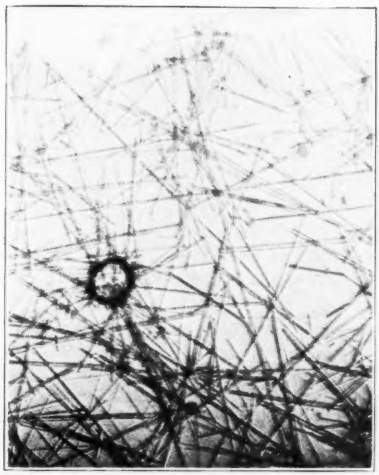


Plate I.

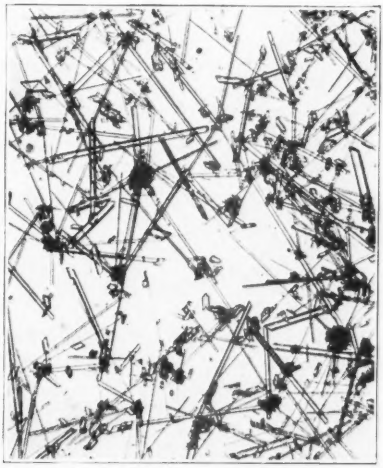


Plate III.

tals of the prismatic type, tho some of these crystal forms tend to give the models a glistening surface with apparent surface hardness.

Plaster of Paris when used as an investment for rubber during the process of vulcanization becomes somewhat dehydrated and upon subsequent gauging with water and observation under the microscope will be seen to set with great rapidity developing long needle forms of crystals, producing excessive expansion.

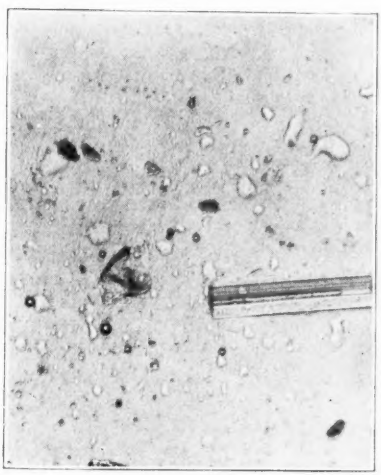


Plate II.

Plate IV.

The effect of various catalizers is readily seen under the microscope when an examination of the individual crystal or crystal mass is made. Potassium silicate (Plate No. VI) or sodium silicate (Plates No. IV and VII) exhibits a tendency to cause the calcium sulphate to crystallize in twin forms.

These crystals are twinned on the orthopinacoid and for the most part are very small and in the direction of their vertical axis are shorter than the calcium sulphate crystal which has not been influenced by the catalizer. Models made of this material show a loss of about 25% of compression resistance. Aluminum sulphate induces a heterogenious mass of needles, prisms and plates. The prisms appear to predominate and occur largely in star-like clusters. The loss in strength of model in this instance is also about 25%. Potassium Sulphate influences the crystal growth in such a manner as to speed up the set, but does not greatly change the form of crystal. The compression resistance of such a model is not materially greater than noted in the cases of the other catalizers mentioned. This, however, does not apply to over-burnt plaster. Plate No. VIII is a micro-photograph of a sample which has been allowed to set for a period of three months. This plaster was produced by calcining gypsum at a temperature slightly in excess of 450°C. It is evident that crystal growth has been slow and that the form of the crystals is such as to preclude any great interlocking ability and hence we would not expect a very strongly bonded model from such an aggregate. If potassium sulphate be added to the water used in gauging such a plaster we find the crystal growth to be rapid and greatly altered in form as is indicated in Plate No. IX. Such a model would exhibit considerable strength.

Gypsum burned at temperatures exceeding 750°C. is termed Hydraulic Gypsum and sets very slowly, requiring many months or years in which to attain maximum hardness. Plate No. X shows the progress of crystalization after setting has proceeded for three months. Only a few crystals are seen and these are of comparatively large dimensions. Such material, closely rammed or compressed from time to time during the setting and hardening period would offer great resistance to compressive forces.

Ammonium sulphate, ammonium chlorid, sodium chlorid and potassium chlorid show no tendency to alter the crystal form other than to produce long acicular crystals. This is due to more rapid growth along the "c" axis than either the ortho or clinoaxis. All of these chlorides and ammonia salts when used in moderate concentration, speed up the setting time of the plaster.

Plate No. XI is pure Plaster of Paris set after gauging with water. This material contains no accelerating or retarding agent and was calcined at 130°C. Impression plaster and model plaster contain small percentages of ground gypsum which has not been subjected to calcination. The gypsum is added for the purpose of producing rapid setting. The crystal development in these plasters respectively may be seen in Plates Nos. XII and XIII.

Apparatus Used for Determinations in the Vulcanizer: The apparatus used in investigating the properties of rubber and plaster in the vulcanizer consists of an ordinary dental vulcanizing retort equipped with two vertical rods which pass thru steam glands in the retort cap (Plates Nos. XIV and XV.) These carry a stirrup equipped with a spherical head operating within the vulcanizer. The external ends of the rods are joined together with a cross head to receive the flange of the compression testing machine. (Plates Nos. XVI and XIX). The retort is also equipped with a steam gauge to indicate the temperature and pressure obtaining inside the vulcanizer. The investment material to be tested is

Plate V.

Plate VII.

molded into a cube two inches on a side, allowed to set for twenty-four hours and then placed on a steel plate in the retort under the spherical head. The retort burner is then lighted and the temperature raised to the desired degree. At the chosen temperature or steam pressure the retort is removed from the nest and placed in the compression machine and the resistance of the model noted. Testing machines and apparatus for constructing models for these tests are com-

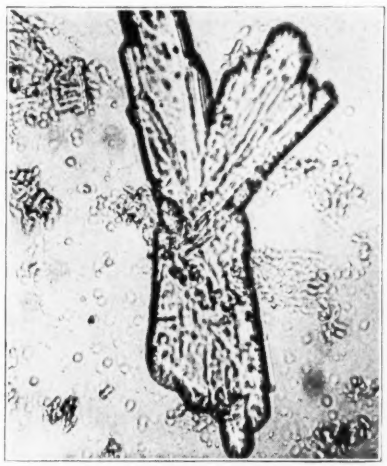


Plate VI.

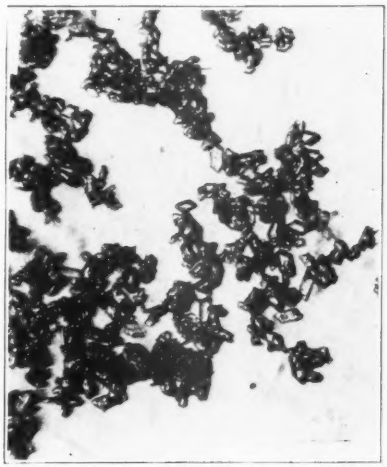


Plate VIII.

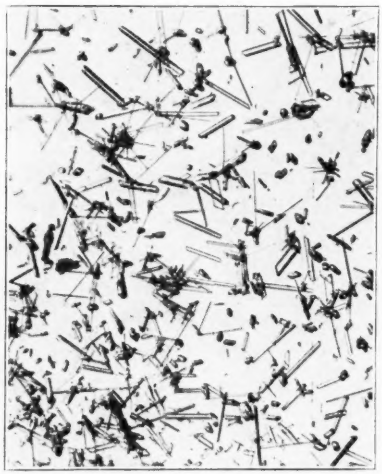


Plate IX.

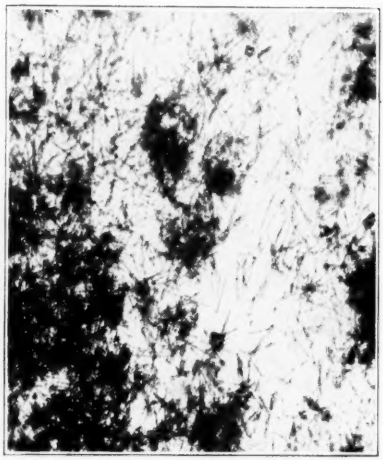


Plate XI.

mon to any well equipped laboratory and present nothing new. All mixes were made up with distilled water at 70°F.

The determination of the behavior of dental rubber in the vulcanizer is made by introducing a tube with neat fitting plunger thru the gland occupied by one of the vertical rods. The tube is equipped with a threaded cap on the end

Plate X.

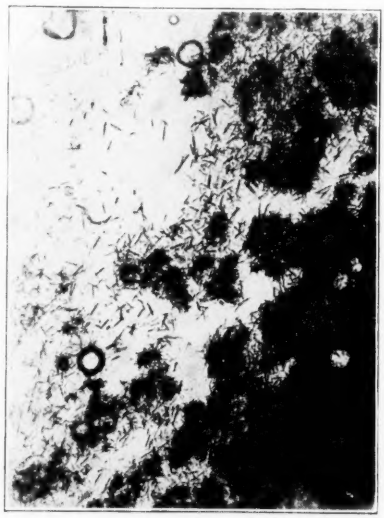


Plate XII.

which is inserted into the steam retort. This cap is removed for the purpose of packing in the unvulcanized rubber. It is then replaced and when inserted in the retort, extends approximately three and a half inches into its chamber. The procedure followed in making a test of the rubber is here given in detail. The unvulcanized rubber is heated over a steam bath to render it easily manipulated and is then packed into the cylinder as noted. The plunger is applied and subjected to a pressure of 800 lbs., per square inch. The plunger is then removed and the tube containing rubber is raised to a temperature of 212°F. and

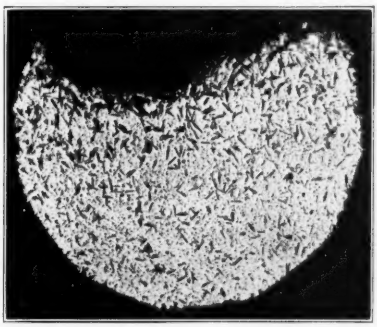


Plate XIII.

maintained at this point for twenty minutes to expel any water which might be incorporated with the rubber. The apparatus is then allowed to cool and is again put in the press and subjected to a pressure of 1800 lbs. per square inch. It is then allowed to stand for ten minutes and the initial measurement is taken to determine the length of rubber plug in the tube. The tube is now inserted thru the gland into the vulcanizing retort with the free end of the tube and plunger exposed. The retort is then brought up to the temperature required in the experiment. At any interval during the process of vulcanization the expansion of the rubber may be determined by a gauge applied to the plunger which rises in accordance with the expansion of the rubber.

Rubber Expansion Data: The data given in connection with the rubber ex-

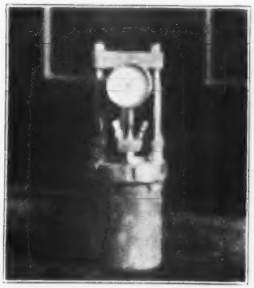


Plate XIV.

pansion is corrected to allow for the expansion of the tube and plunger due to their rise in temperature. On Plate No. XVII will be found a curve indicating the behavior of the rubber during the early stages of vulcanization. The rubber tested was Doherty Red Rubber.

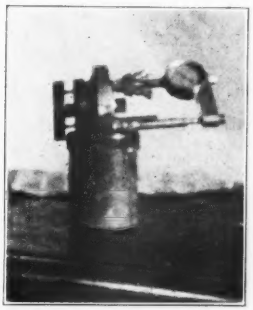


Plate XV.

The expansion period of the rubber during vulcanization is, of course, of prime importance, since the greatest demand is made upon the plaster during this period. A study of the rubber expansion curve (Plate No. XVIII) will

show that during the interval of twenty-three minutes occupied in raising the temperature of the water in the retort from room temperature to 320 degrees F., the rubber expands rapidly and that after this interval there is no more expansion, at least during the sixty minute interval. It is probable that the expansion would almost entirely occur below 275 to 285°F., if the rubber were allowed to remain at this temperature for some twenty minutes or so. This, of course, would be a decided advantage owing to the fact that the set plaster begins to dehydrate at 107°C. or about 224°F and since the dehydration process is slow at this temperature the resistance of the investment would not be seriously effected.

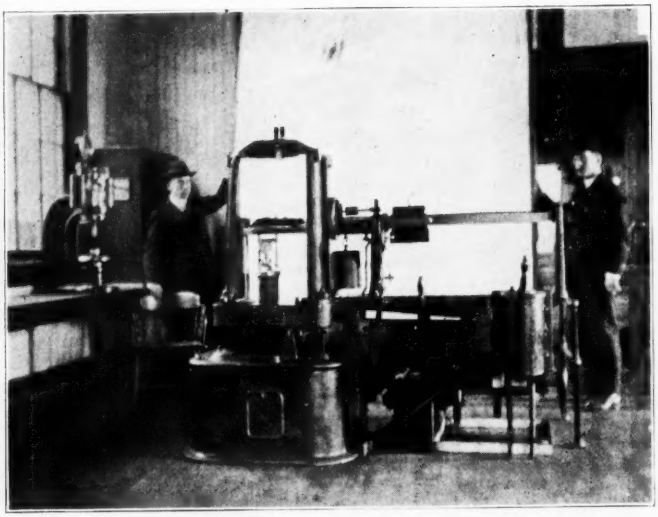


Plate XVI.

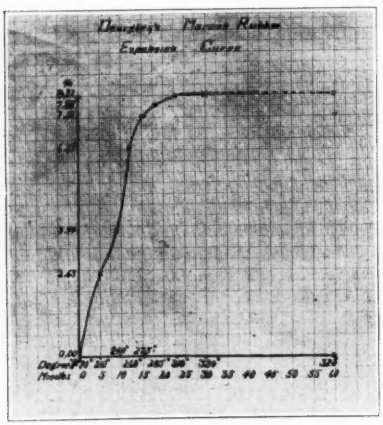


Plate XVII.

Having determined the critical temperatures for the rubber, data showing the behavior of the investment during a similar period will be of interest. The resistance to compressive stress is of most importance in this connection, since we need not consider the expansion phenomenon of the investment during vulcanization. Tabulation No. 3 exhibits the behavior of the investment compounded as above described as well as other plasters and plaster investment material on the market. The models to be tested

were subjected to the same vulcanizing condition as that followed in the rubber

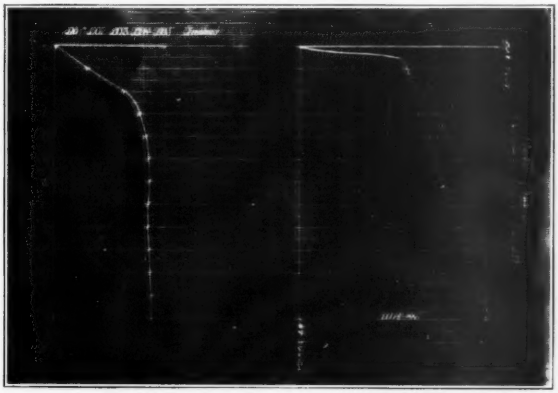


Plate XVIII.

tests. From this tabulation it will be observed that all of the investments

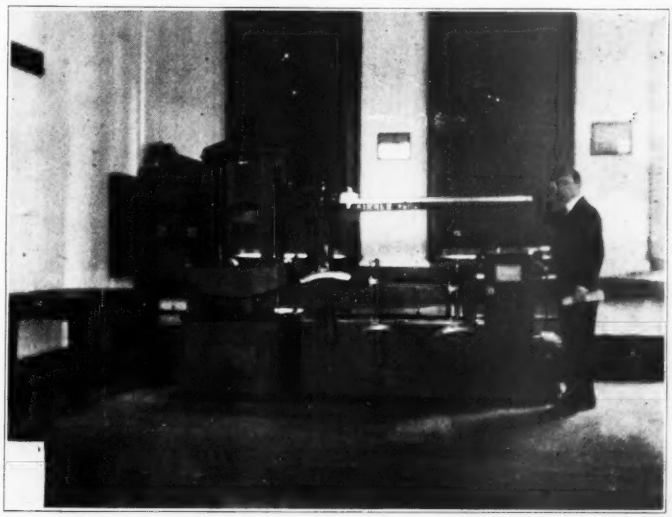


Plate XIX.

studied, having gypsum plaster as a base lose 42% to 73% of their compression resistance during the 23 minute interval required to raise the temperature in the retort from 70°F. to 320°F. It may be farther observed that the investment compound described in this paper and appearing in the tabulation as

"Golden Poppy" shows the least per cent. in loss of strength. The plaster styled "Pottery" is not an investment material which has been adjusted for expansion but represents the plaster base from which the Golden Poppy is made. Investments containing sand return the best results. These fail with a characteristic bump and appear to offer somewhat greater percentage resistance than smooth materials examined.

TABULATION NO. 3.

INVESTMENT TESTS IN VULCANIZER.

Investment	Water Plaster Ratio.	Compression Resistance of Model per 4 sq. in. in air before heating.	Compression Resistance of Model per 4 sq. in. in Vulcanizer @ 320°F.
Spence	.28	10,000	3900
	.28	10,000	4000
Weinstein	.55	5,520	1900
	.55	4,840	1900
	.35	11,600	3200
Golden Poppy	.30 (fluid)	4,400	2620
	.30 (fluid)	4,400	2600
	.25 (stiff)	4,800	2900
	.22 (stiff)	4,800	2800
Pottery	.50 (stiff)	5,000	2650*
	.60	5,000	1750*
Pottery screen to pass 200 mesh	.50	5,140	2350*
Pottery on 200 mesh	.45	4,000	2475*

*Almost same consistency of mix.

Note.—Models for testing 2 in. x 2 in. x 2 in.—24 hours old. Temperature of retort raised from 70°F. to 320°F. in 23 minute interval. Models tested while in vulcanizer before blowing off steam. Samples which were tested after blowing off steam and removed from the vulcanizer showed an additional loss of strength, about 30% of that obtaining in the vulcanizer.

Conclusions.

(1) Increasing the water-plaster ratio reduces the expansion of plaster at the expense of strength of the model.

(2) The more finely ground the plaster, within certain limits investigated, (150 to 200 mesh) the stronger will be the resultant model if mixed to same water-plaster ration and that for mixes of the same fluidity, the coarser material (with certain limits) is the stronger.

(3) The degree of fineness of plaster within certain limits has little or no effect upon expansion except inasmuch as the finer material in a given water-plaster ratio produces a somewhat stiffer mix resulting in a very slight expansion increase.

(4) The ingredients of an investment as outlined above are so variable in their physical properties, that it is quite obvious, a constant ratio of plaster, sand and ground clinker will not produce a material having zero expansion, but nearly so.

(5) Plaster of Paris dehydrates in the steam retort at vulcanizing temperatures.

(6) Plaster dehydrated in the vulcanizer becomes accelerated, and upon lowering temperature or removal from the vulcanizer, sets with exaggerated expansion.

(7) Vulcanite dentures flasked with flasking compound having Plaster of Paris as a base should be cooled and removed from the flask at once upon completion of vulcanization.

(8) Rubber expands in the vulcanizer, at least during the twenty-three minute interval in passing from room temperature to 75 lbs. steam pressure, or 320°F.

(9) It is desirable to maintain the temperature in the retort at a low degree

for at least twenty minutes to allow the complete expansion of rubber to take place.

(10) Vulcanite flasks should be equipped with spring tension to allow the flask to open in response to the rubber expansion demand.

(11) A large excess of rubber should not be allowed in the packing of a case for vulcanization.

(12) When bolted flasks are used special care should be exercised in providing adequate vents to accommodate the expanding rubber.

(13) Vents in bolted flasks may not be wholly satisfactory owing to the liability of plugging by vulcanized rubber, or other obstruction.

(14) Investments for vulcanization of dental rubber may be successfully compounded with Plaster of Paris as a base.

(15) An investment material exhibiting no expansion upon setting and possessing much less resistance to compressive forces than the investment herein described may be suitable for investing dental rubber for vulcanization in flasks other than bolted ones, which are provided with adjustments to close the flask while in the steam retort and which will accommodate themselves to the expansion of the rubber in the vulcanizer, thus minimizing the strain brought upon it.

391 Sutter St.

IS THE OVERFILLING OF PULP CANALS A SAFE PROCEDURE?

By Elmer S. Best, D. D. S., Minneapolis, Minn.

(Read before the 1917 Annual Meeting of the National Dental Association.)

TO COMMENT on the overfilling of pulp canals by the great body of dentists a few years ago would have been unheard of, but within the past three years a peculiarly significant restlessness, gradually taking on the form of a widespread desire to do better work, has made its appearance. The development of the movement that followed, and the direction of its activities were the result, not of outside agitation, but of extensive and impartial self-analysis, a determined searching for the truth, and a firm resolve to correct mistakes made in the past and prevent their recurrence. This movement is growing so rapidly that we must now prepare for future contingencies. Hence, your essayist feels that a discussion of this subject is in reality not premature.

Pulp canals are being opened farther and farther each year until now we are getting close to the end, and many of them when filled, show that the filling slipped thru. Not because the operator in all cases tried to accomplish such results, but rather because of the fact that our improved instruments and technic have made such a thing possible in the hands of the majority of men who honestly and intelligently try. It is done, not from design, but because it was apparently unavoidable.

Altogether too many times pulp canal operations are considered of purely mechanical procedure and the limit of responsibility lies at the apical point of canal filling. The main question is, "Is it filled?" We never seem to get over feeling a thrill of pride when our Radiograph shows the canal filling reaching the apex and possibly appearing on the cementum. We know this to be so, we also know how infrequently when we examine our Radiograph showing such an operation, that we ask ourselves the question, "Will this case show subsequent infection?"

So we have fought our way thru the pulp canal question, from the time when we thought, or hoped that the apex of each root was not over a quarter of an inch from the floor of the pulp chamber, that is, we knew in extracted teeth the roots are longer, but somehow or other, we cherished the hope that in the mouth, that just for once, and that at the time we were filling them that they would be "oh so short" and that surely we reach the apex when filling, for remember we all tried to practice good dentistry and "do the best we could by our patients" Then we pass on up to the time when we finally discovered ways and means of actually opening some of the "inaccessible" canals. Then came the time when we began to X-ray all these pulpless teeth and we never had any idea that so many other dentists had filled root-canals for our patients, positively it was unbelievable. Then we got over that spasm and each man decided to claim his own and get down to work, and here we are today, plowing

ahead, rapidly approaching that apex, for mind you, the hidden part of dentistry is becoming more thoro and more understood.

Now, before we finally emerge from the pulp canal thru the multiple foramina, just let us do a little experimenting. There is a solemn warning right here. We have arrived at the point where a tremendous amount of damage may be done and doubtless is being done.

Let us go into our laboratory, select a tooth, open the canals, do the work as we do in the mouth. Underfilled and overfilled roots show absorbed periapical areas. Deducting the cases where infection occurred previous to the root-canal operation, these being probably about evenly divided, we find that we have a large percentage of cases where we must explain how it happened that we have these areas of infection. Anyone who has done laboratory experimentation on extracted teeth, must realize that, after the work ordinarily done in opening and cleansing a canal, such a canal as a general rule is not even ordinarily clean, and now comes the danger of overfilling. *With such debris in the canal, by our modern method which pumps and drives the canal filling up to and thru the foramin, we succeed in forcing the unremoved contents of the canal thru into the periapical tissues, along with the filling material.*

Here is one of our gravest dangers in overfilling of canals, and there is so much for you to consider on this point alone, in view of the fact that in overfilling we may actually force into the patient's system, some material we would not if we knew, that, your essayist is going to leave the question for each one to settle for himself. During your instrumentation in the laboratory watch that apex and see what we poke thru, especially as we operate in the apical portion. Then let us fill the root, and as we work the canal filling into the canal and thru the apex scrutinize carefully, and behold what has passed thru with the filling material.

This reference is of course to macroscopic material only. How about microorganisms? How about drugs that destroy living tissues? Let us stop and consider this for a little while. We may in some cases safely carry our canal filling thru the apex, *but let us be careful of the company it keeps.* An examination of several thousand films makes it conclusively apparent that it is not solely a mechanical problem, but also one of surgical cleanliness. If you feel that this is a point worthy of your consideration and you have now decided to go home and investigate the problem and like the boy who investigated and found out about this "Santa Claus business," you may find out that accepting some other person's word for it may not be an accurate means of locating the truth. In consequence, from now on each of us will do a little looking around for himself.

From the foregoing you may easily infer that your essayist has not established the point at which all his canal fillings terminate: the reason being that they vary so in their willingness to stop where we want them. It is my positive belief that from radiographic evidence at least a root-canal filling can be called satisfactory even tho it does not appear on the cementum when examined with the X-ray. In contradistinction it might also be said that the operator, who, with a drill in the engine, plunges blindly into a canal; stopping only when the patient informs him that he is thru the root, in order that his film may show a canal filling reaching the apex, is not doing serviceable pulp canal work. He is playing to the gallery—I submit to you this proposition: We should not be satisfied with our present operation. It is not altogether satisfactory, hence we should not rest on our oars, but must drive ahead for we are going to succeed. Your essayist is so confident that success will be ours that he is putting more

and more time on this problem with the hope that very soon the problem will be solved.

Now let us pass on to another vitally important problem. Medicine and Dentistry have in the past on a few occasions, come very close to one another, but they never quite found conditions such that in pursuing their normal activities they discovered that they were in reality traveling side by side.

Dentistry has surely some time since passed from the limitations of mechanics with which for years she was surrounded, and with the branching out of the Orthodontist, the Oral Surgeon, the Pyorrhea and Root-Canal Specialist, the Exodontist, the Children's Specialist, the Prophylactician and the Radiodontist we have so thrust our work into, around and between that of our medical co-workers that our relations have been very intimate. And now comes the grandest chance we have ever had to cement this relationship. It is in "Oral Examination and Diagnosis."

Just what do we mean by this? We have examined mouths for years. Yes. The first experience we generally get along this line is in the examination room at College, where the mouths of infirmary patients are examined. We were taught (I understand it is all different now) that we must look carefully for cavities, missing teeth, pyorrhea, and "fill" any roots that were not already stopped with Gutta-Percha. Alas! many of us carry this idea yet, and when we are asked to make an examination we assume that this is what is wanted, and we serenely pass over the greatest opportunity the dental profession ever had to put itself on record as being something more, so much more, than a profession all absorbed in mechanics.

So at this time it is your essayist's desire to make a little contribution to dentistry and tell you how we examine a mouth and how the fate of the various teeth is decided. It is accompanied with a friendly suggestion of danger ahead if we overlook or shirk our duty, and a plea that some such system be adopted and put into actual use. Do not overlook your opportunity. It is still time to take this step voluntarily. What the future will be no one can tell, the great war has discouraged prophesying.

As we begin this examination, let me draw your attention to the fact that most people have from one to as high as fifteen or more pulpless teeth in their mouths? In view of the fact that until recently a very large percentage of the pulpless teeth were infected, the staggering possibilities in this connection must alarm even the most indifferent.

In the advocating of complete oral examinations of our patients' mouths, in order that we may know where to begin, we must expect to encounter the same opposition that we have in establishing thoro root-canal work as routine procedure, but it is the next step we must take in dentistry.

If patient's mouths were in ideal health we would not have a great deal to do for them, but unfortunately for them they show various degrees of disease, and we are confronted with the problem of bringing these mouths up to as high a degree of perfection as we possibly can. We can reconstruct the masticating apparatus of the patient along purely mechanical lines. That is, on apparently sound teeth we build possibly wonderful restorative structures and give the patient something to masticate with, and there our effort ends. Or on the other hand, we can practice dentistry from the health standpoint. By this we mean that everything that is in that patient's mouth when we finish is placed there or has been allowed to remain there because it is conducive to good health. We will not discuss in this paper the ways and means of getting rid of infected areas around root ends; only one thing we must decide and that

is that these areas must go, we must thoroly clean them up.

In this connection your essayist wants to make a plea for the standardization of X-ray diagnosis, so that there will be a little more similarity in the way in which these films are interpreted. Dentistry has been able to advance by means of the use of the X-ray, but if some instances which have come under my observation should be of frequent occurrence, it will not redound to the glory and uplifting of the dental profession, but will tend to make it ridiculous.

In closing, your essayist wishes to take advantage of this opportunity to thank his professional friends from whom he has from time to time received valuable information and lasting inspirations, and that while we all make mistakes, yet ours are not more numerous or any more serious than those of the members of any other profession. And lastly, on thinking it all over and realizing that it is the year 1917 with all its opportunites, he can say with honesty and sincerity, that he is proud to belong to the dental profession.

DENTAL AND ORAL HYGIENE IN RELATION TO PUBLIC HEALTH.

By Louis Ottofy, D. D. S., M. D., Manila, Philippine Islands.

(Read before the meeting of the Philippine Islands Medical Association and the IV Asamblea Regional de Medicos y Farmaceuticos de Filipinas, Manila, February 8, 1918.)

FOR one who is familiar with the progress of dentistry for more than a third of a century, it is gratifying to note the gradually increasing appreciation of the service of dentistry on behalf of humanity. A definite status of the worth of the dental profession has recently been established by the Congress of the United States, in a law which places the members of the dental profession in the United States Army, on an equal plane with members of the medical profession.

A certain recognition is also apparent here in the Philippine Islands, by members of these Associations now in session. I notice that three of the papers to be read before this body are directly concerned with dentistry, and with the discoveries made by dentists in the interest of science.

In some respects it is remarkable that the influence of dental and oral hygiene on the general health, should have been so long without proper recognition and appreciation. When we reflect for a moment, that all food designed for the upbuilding of the system must pass thru the oral portal, and when we note our knowledge concerning parasites and bacteria, and knowing that the constant habitat of many species is in the oral cavity, it seems little short of marvelous that most earnest attention has not been directed to the subject a long time ago.

The recent recognition of focal infection as the result of diseases the teeth and their adnexa has forcibly directed

attention to the subject. As is always the case, just at present the evil effects are overestimated, but it will be only a short time when the true level is found. Not unlike when nitrous oxide was introduced to the profession, and then again when vulcanite as a base for dentures came upon the field,—many useful teeth were sacrificed to the new gods,—we are just approaching the end of the useless removal of serviceable teeth, of which many have been removed under the mistaken belief that they were injurious to the system. That wonderful contribution to science, the X-ray, is also in part responsible for the irreparable damage now fortunately on the wane. Inexperienced men, well meaning, but insufficiently informed, have produced negatives upon which they read, or misread, the fate of many an incisor or molar.

However, the pendulum is swinging back to normal, and with it comes the due appreciation of the exact situation and a proper recognition of the serious problems involved. The object to be attained,—freedom from infection on and about the teeth,—is simple enough, but the means are obscure and difficult.

The more closely the subject is studied the more earnest and honest men in the dental profession are striving for the correct remedies, the more does it become a conviction, that after all, our remedies are but feeble and uncertain, and the cry goes out, that salvation lies in prophylaxis, that prevention is the only true and reliable remedy, and the slogan dinned into the ears of all is: "A clean tooth never decays."

So far as the Philippines are concerned, and so far as the relation of dental and oral hygiene to the public health among our people is concerned, I apprehend we can do but little in entering upon fields of investigation, without so vast a preparation as may be considered out of the question have and at the present. All that we can do here, in dental roentgenology, is to go in at the doors where others have come out; in other words to repeat the experiments, to follow the experiences of others more competent, and more thoroly equipped, and hence to reach the same conclusions. As a pastime or personal amusement this is quite commendable, but as an addition to the fund or knowledge, it is of but doubtful value.

Until we have secured the examination and the tabulation of the condition of the teeth of the growing generations, we were in no position to know exactly to what extent dental caries was prevalent, and to what extent an unhealthy influence was exerted upon the whole system. Such examinations have now been made in nearly all civilized countries, and the fact has been established, that, (barring different results obtained due to different methods of examination,) dental caries is generally and practically equally present in all countries, and among all civilized peoples. I have made examinations in the Philippine Islands, among school children, University students and Filipino soldiers, and have added to the general information on this subject statistical data which prove that dental caries is as prevalent here as in other countries, and that it is therefore a subject as equally important in the Philippines as elsewhere. I omit mentioning examinations I made among Igorots and Negritos, as I consider it a subject apart.

Considering here this matter in the phase of public welfare, of service looking to the betterment of the health of the Filipino people, there is very little I have to say concerning the preservative and reparative treatment which is largely the occupation of the average dentist, but will rather direct your attention, as practitioners of medicine to the preventive and conservative side, of the subject, —a side with which you gentlemen have as much to do, and in which you can not only give as much, but even more aid than the dental practitioner. So far as temporary relief, reparation of dam-

age already incurred, is concerned, of late years considerable activity has been developed. In Manila we have had dental infirmaries, connected with hospitals, and with Bilibid prison for some years. Of late years one of these infirmaries has been established in one of the schools, and quite recently the Director of Education has recommended that in all the provinces dentists be attached to the schools. The Constabulary and the National Guard have interested themselves in providing dental services for the forces concerned. But all these, as above stated are largely of a temporary or reparative nature, and can be considered only measurably as being of a preventive character.

The solution lies in prophylaxis, and the field in the schools, public and private. The reparative work must be done by the dentist, always. That means a large personnel. The conservative work is done by the individual, by the child itself. If all the dentists now in practice in the Philippine Islands, were to come to Manila and devote their entire time to the caring of the teeth of the school children only, the number would be insufficient to make any well defined impression upon the general dental condition, commensurate with the cost and the sacrifice. The more I see of the work done, the more I appreciate and recognize the good that the dental work is doing, the more am I convinced that the result, looming large as it does, is but a trifle compared with what should be done. Furthermore in a country like this, where the economic conditions are as yet unsettled, and many people are poor, the cost is an important item. Prevention is not only simpler, but it is also much cheaper.

My observation among the school children convinces me, that a large number of the cases of anemic, apparently underfed children is due the condition of the mouth. My examinations have shown, (not wishing to burden you with the actual figures), that during the period of the child's primary school years, there are present a large number of broken, decayed, temporary teeth and roots, constantly bathed in pus. The removal of these, I am convinced, is at present the most urgent, so far as dental care is concerned. This in itself is an immense problem, and in view of the timidity of children, their fear and dread of pain, notwithstanding effective local anesthesia, a difficult one to handle.

But even in these cases, and others in which the permanent teeth are concerned, it is astounding to what extent a healthy condition can be brought about by the mere cleaning of the teeth, provided it is regularly continued. To secure the regularity of the cleaning,—regularity being placed in importance above thoroness—the tooth brush drills have been established in some of the schools in the United States, and we have here a small beginning in a daily tooth brush drill participated in by two hundred children at the Meisic Primary School.

I have read exaggerated reports of the immense results accomplished by just such work as we do at that school, even so much as to have it claimed that all decay of the teeth ceased, I must nevertheless confess, that the results obtained by the regular brushing of the teeth, by many of these children who have never used a tooth brush, is indeed remarkable. I have examined the teeth of girls after they have persisted at these drills for some months, and found that the plaques which are the forerunners of dental caries, have been entirely removed, and that they can be kept away only by the daily use of the brush. For reasons into which it is not necessary to enter at this time, the children are obliged to leave their toothbrushes at the school house, with the result that on Saturdays and Sundays, (many of them), have no means to, or do not brush their teeth. so that on Monday morning, the difference was at once noticeable. But the most important improvement is the establish-

ing of a healthy condition about broken roots, (and even about actively abscessed teeth,) that can not act otherwise than in a most favorable way upon the whole system of the child. Here is the point, where dental hygiene gravely touches public health, here we remove bacteria from infected mouths, and reduce the possibilities of infection and disease not only in the interest of the individual concerned but in the interest of those with whom he comes in contact.

In many of the cities in which you gentlemen practice your profession there are no dentists located at the present time, in the greater part of this country where your activities are exerted, there are no dentists, and I make this plea to you: to interest yourselves as medical men in this subject. Dental clinics may be established, but pending the availability of funds for that purpose, the great work of prevention can go on everywhere. A provision of drinking cups, toothbrushes and toothpaste, a setting aside for a few minutes daily either from the study hours or from the recreation periods, and the children will gain inestimable benefits; indeed to such an extent, that if you can establish this work in a small barrio, where you know the children, and where you can keep them under your personal observation, I know that you will soon note a general improvement, an imparting of a healthy tone which has never before been observed. This has been noticed and recorded in a lay way by many teachers. They report both mental and physical improvement. The latter is first observed. In any school room, at any time, if there are fifty pupils present, and the actual truth can be ascertained there are four or five pupils who are at the time suffering pain from the teeth. They may or may not just then admit it. While of course great benefit would accrue to these children by the presence of a dentist, who could give them relief, I have found that cleaning the teeth will in many of the instances give relief. This is usual in those cases where putrid matter is locked within a cavity, and thus produced an inflammation of the peridental membrane. Or at times, pressure of food stuff in a cavity, or close to the pulp is relieved, while in others the reduction of inflammation of the gums, surrounding a diseased tooth, will be given relief. Later, the teacher notes the mental relief, the children become actually more bright and alert. The dental infirmary and the toothbrush drill combined have brought many other advantages, minor as compared with the improvement of the general health, and yet sufficiently important to be recognized.

Absence from school, attributed properly or wrongfully to toothache, ceases, and the time of the child as a student is saved. Adding up the losses thus caused, and the necessity for repeating, as children in poor health must do, there is a considerable item of expense to the community which would not have to be borne. These are not fanciful imaginings, but actual facts demonstrated by results.

The taking up of these few moments of your time, I know would be fully justified, if each of you will interest himself in this subject, in his capacity as a practitioner of medicine.

THE PERFUSION EXPERIMENT IN THE STUDY OF CELLULAR ANAPHYLAXIS.*

By W. P. Larson and E. T. Bell, Minneapolis, Minn.

From the Department of Bacteriology and Pathology, University of Minnesota, Minneapolis.

ALTHO a large amount of work has been done in recent years in attempts to determine the fundamental nature of anaphylaxis, this problem has been entirely cleared up. It is not the purpose of this paper to attempt in any way to review the vast literature which has accumulated on the subject. In the interest of context, however, it may be recalled that there are two theories regarding the fundamental mechanism of anaphylaxis. Friedberger and his pupils hold to the humoral theory. According to this conception when an antigen is acted on by its specific antibody of the third order the antigen is broken up into toxic substances which are called anaphylatoxin or apotoxin, to which all manifestations of protein anaphylaxis are ascribed. This conception of the mechanism of anaphylaxis would seem to be supported by the test tube experiment, in which apotoxin may be readily formed by bringing together the suitable reagents. The humoral theory is, however, wholly inadequate to account for the observation that, if an animal is immunized passively, a certain incubation period must elapse before anaphylactic phenomena manifest themselves on the introduction of the antigen.

It was a study of the mechanism of passive anaphylaxis that led to the development of the cellular theory, the chief proponents of which are Schultz,[1] Dale,[2] Weil,[3] and Cocoa.[4] According to the cellular theory the site of reaction in anaphylactic phenomena is not in the tissue fluids but within the cells. When an animal is immunized passively it is assumed that the tissue cells appropriate the antibodies and thus become sensitized to the antigen. According to the view of the proponents of the cellular theory of anaphylaxis, we have here a plausible explanation of the period of latency required to effect passive sensitization, which the Friedberger theory does not supply. If we accept this explanation of anaphylaxis it is apparent that the tissue cells discriminate between the different orders of antibodies, as passive immunization does not always sensitize against the specific antigen. Were this the case it would be the height of folly to administer tetanus antitoxin prophylactically, as such treatment would sensitize the individual to tetanus rather than afford protection. It is, on the contrary, admittedly good therapeutics to immunize passively against tetanus and in some cases against diphtheria as well. The individual immunized against tetanus never becomes more sensitive, but invariably more immune to tetanus toxin. If the tissue cells should appropriate the injected tetanus antitoxin and the individual later become infected with tetanus, the passive immu-

*This work was aided by a grant from the Research Institute of the National Dental Association.

[1]Jour. Pharm. and Exper. Ther., 1910, 1, p. 549; Hygienic Lab., Bull. No. 80, 1912.

[2]Jour. Pharm. and Exper. Ther., 1913, 4, p. 167.

[3]Jour. Med. Research, 1913, 22, p. 497; 1914, 25, p. 87 and p. 299.

[4]Ztschr. f. Immunitätsforsch. u. exper. Therap., O., 1914, 20, p. 622.

Reprinted from The Journal of Infectious Diseases, Vol. 24, No. 3, March, 1919, pp. 185-190.

nization would probably prove fatal. It would therefore appear that antibodies of the first order are not involved in the mechanism of cellular anaphylaxis. The question as to the reason for this discrimination by the tissue cells between the antibodies of the first and third order would indeed be an interesting problem for investigation.

While there are some very potent objections to the unreserved acceptance of the cellular theory of anaphylaxis, it has, on the other hand much in its favor. The fact that a period of incubation of at least from 4-6 hours is required to sensitize passively would seem to allow of no other explanation. This is further supported by the observation of Weil that tissue sensitization is coincident with the disappearance of antibodies from the blood stream. Weil found further that a sensitized animal could be protected from anaphylaxis by insuring the presence of antibodies in the blood stream when the antigen was given.

The final supporting pillar to the theory of cellular anaphylaxis was furnished by the work of Schultz and Dale who attempted to wash the sensitized tissues free of blood and lymph, after which such tissues were exposed to the stimulus of their specific antigens. These experiments presuppose the ability completely to isolate the tissue cells from the body fluids. Dale washed the uterus of the guinea-pig supposedly free of blood by inserting a cannula into the abdominal aorta and perfusing the lower half of the body with Locke's fluid, allowing the efferent fluid to escape from the inferior vena cava. The perfusion was continued for upwards of half an hour" until the efferent fluid appeared free of blood. The same technic has been used by Weil and others in the study of cellular anaphylaxis in guinea-pigs.

No attempt was made by these authors to estimate the amount of residual blood remaining in the tissues following perfusion. Such investigation was undertaken by Cocoa. By estimating the amount of blood cells and complement in the perfusion fluid he arrived at the conclusion that from 1.6-6% of residual blood remained in the tissues following perfusion.

Manwaring[5] perfused the lungs of normal and anaphylactic guinea-pigs by putting the afferent cannula into the pulmonary artery and allowing the fluid to escape thru an incision in the left auricle. Assuming that he had washed the lungs free of blood with Locke's solution, he concluded that the anaphylactic reaction was partly cellular and partly humoral.

In studying spontaneous phagocytosis in the liver with India ink we were surprised to find that the ink particles were deposited only in restricted areas of the organ. It was evident that only a small part of the liver was traversed by the perfusing fluid. This observation suggested the possibility of making use of this procedure in studying the course of the perfusing fluid thru an organ and in determining to what extent it is possible to wash an organ free of blood.

EXPERIMENTS.

The apparatus is so constructed that fluid, at body temperature, may be passed thru the organ and collected for examination. The animal is placed inside an incubator kept at a temperature of 37 C. A funnel provided with a stopcock is supported on a ring-stand. Fluid from the funnel passes thru a glass coil which rests in a beaker of water kept at a temperature of 38 C. A rubber tube leads from the glass coil thru a small hole in the side of the incubator to the afferent cannula. This tube is connected with a mercury manometer and the height of the funnel is so adjusted that the manometer registers a pressure of about 2-3 cm. Hg. The efferent cannula is connected with a rubber tube which passes thru a small hole in the side of the incubator so that the fluid may be collected outside. Several places are provided to let out any air bubbles which may get into the apparatus. By means of the stopcock on the funnel the perfusion may be discontinued temporarily at any time. Locke's solution, at a temperature of about 37 C., was used to perfuse the organs. Most of the experiments were performed on the liver, but the lungs and the uterus were also per-

[5]Jour. Immunol., 1917, 2, p. 157.

fused a few times each. A typical experiment will illustrate the procedure and the results.

The rabbit is killed with ether. Before the heart quits beating a cannula containing sodium citrate is inserted into the portal vein near its entrance into the transverse fissure of the liver. The gastric vessels in the lesser omentum are then tied off. Another cannula is inserted into the superior vena cava in the thorax. From 50-100 c c of Locke's solution warmed to 37 C. are passed thru immediately under gentle pressure to wash out most of the blood. The animal is then put into an incubator (temperature 37-40 C.) and the perfusion is begun at once, about 10 minutes after the insertion of the first cannula. The manometer registers a pressure of about 2-3 cm. Hg. Perfusion begins at 2:55. Fluid from exit cannula is reddish at first but finally becomes clear. At 3:07 a faint trace of albumin in fluid from exit cannula; 3:15, albumin negative. Perfusion stopped for 3 minutes, then continued. Fluid is now blood stained, shows erythrocytes microscopically, and gives positive albumin test. 3:22, albumin negative; perfusion stopped for 5 minutes. 3:27, perfusion begun again. Fluid contains blood. Albumin strongly positive. 3:35, albumin negative. Perfusion discontinued for 6 minutes. 3:41, perfusion continued. Blood and albumin present. 3:48, albumin negative. Perfusion discontinued for 5 minutes. At 3:53, perfusion continued. Blood and albumin present. 4:00, albumin negative. Perfusion discontinued for 5 minutes. 4:05, perfusion continued. Blood and albumin present. 4:06, end of experiment. About 2,000 c c of Locke's solution has been passed thru the liver.

All perfusions, whether of liver, lung, or uterus, give about the same results. It is never possible to wash out all the blood and albumin. The fluid from the exit cannula soon becomes free of albumin and blood, but if the perfusion is discontinued for a few minutes both these substances reappear. The explanation of this phenomenon will be more apparent after we have considered the experiments with India ink.

Typical India Ink Experiment.

A liver is prepared as described above and washed with 1,000 c c of Locke's solution. The fluid from the exit cannula is free from albumin. Then a little India ink (Higgins) is added to another 1,000 c c of Locke's solution and this is passed thru the liver. The ink suspension is very thin. At first the fluid from the exit cannula is clear, all the ink particles having been taken up by the endothelial cells of the liver. Later on the fluid from the exit cannula is just as dark as that entering the afferent cannula, showing that no more ink particles are being held in the liver. The perfusion is discontinued at this point. The pressure is constant thruout the experiment and the rate of flow from the exit cannula is unchanged, indicating that there is no obstruction to the flow of the fluid.

A liver perfused with Locke's solution containing India Ink shows blackened portions, the black color being due to retention of the carbon particles of the ink by the endothelial cells of the liver. The blackened areas evidently correspond to the parts of the liver thru which the perfusing fluid passed. There is great variation in the size and position of the blackened areas in different specimens. In every case there are large areas of liver tissue not blackened at all. In some instances only the dorsal part of the liver is blackened (this is the lower part during the perfusion); in others only a comparatively small area around the hilus. The blackened areas shown in Figures 1, 2, 3, and 4 indicate the parts of the liver thru which the perfusing fluid actually passed. It is clear that even in the most favorable cases there are extensive areas of liver tissue not reached by the perfusing fluid and that sometimes only an insignificantly small part of the liver is perfused. Even in blackened portions of the liver the cut surface shows that the fluid has reached only the central parts of the lobule (Figure 5.) It is therefore an error to assume that all the blood has been washed out of the liver because the fluid coming from the organ is free from albumin.

It was pointed out in the foregoing that it is not possible to wash all the blood out of the liver. It is easy to get the fluid from the liver free from albumin by continuous rather rapid perfusion; but if the perfusion is discontinued for a few minutes blood and albumin invariably reappear. The experiments with ink give us a clear explanation of this phenomenon. The perfusing fluid traverses only certain parts of the liver and these soon become free of blood; but during the periods when the perfusion is discontinued, blood from the adjacent areas of liver tissue diffuses

into the main path of the fluid. Hence, at each renewal of the perfusion after a pause blood and albumin reappear.

On theoretical grounds it is not to be expected that all of the blood can be washed out of an organ with Locke's solution since the latter is much thinner than blood and produces much less friction on the walls of the vessels. As soon as a passage is opened up thru the organ the resistance along this route will be much less than thru capillaries containing blood, and the fluid will take the path of least resistance.

Air bubbles cannot be a factor in directing the course of the perfusing fluid since these were always carefully excluded. The ink does not block any of the blood vessels. The carbon particles are found on microscopic examination for the most part in the endothelial cells. A liver blackened by an ink perfusion is unaffected by washing with clear Locke's solution. No carbon particles are washed out.

The lungs were perfused by putting the afferent cannula in the pulmonary artery and the efferent in the left auricle. The trachea was ligatured before the thorax was opened to prevent collapse of the lungs. It was also found impossible to wash all the blood out of the lungs. The efferent fluid soon became free of blood and albumin, but both these substances reappeared after temporary interruption of the perfusion. Perfusion with India ink, after preliminary washing with Locke's solution, showed the same irregular blackening of the lung tissue as was described above in the liver (Figure 6.)

The uterus was perfused according to Dale's method. In general, the same results were obtained as with the lungs and the liver.

Since the perfusion of an organ is so incomplete it is obvious that circulating antibodies are not entirely removed by this procedure. It follows that the experiments of Dale and Weil with perfused uterine muscle cannot be regarded as lending any support to the theory of cellular anaphylaxis. In like manner it will be seen that the presence of cellular antibody is not established in Manwarings' experiment with 14-day anaphylactic lung.

It is recognized by us that our experiments do not overthrow the doctrine of cellular anaphylaxis. It is our purpose only to call attention to the unsoundness of one of the main arguments which have been advanced in its support.

Summary.

It has been shown that it is impossible to wash all the blood out of an organ by perfusion methods. The efferent fluid becomes free from blood and albumin in a short time, but these substances reappear if the perfusion is temporarily discontinued a few minutes.

By perfusing organs with Locke's solution containing India ink, the course taken by the fluid thru the organ has been mapped out. It has been found that a surprisingly small part of the capillary system is really washed out by the perfusing fluid.

This technic does not therefore remove circulating antibodies completely, as has been assumed, and this type of experiment does not establish the presence of cellular antibodies.

Explanation of Plate.

The organs were first perfused continuously with warm Locke's solution until the efferent fluid was free from albumin, after which they were perfused with warm Locke's solution to which some India ink had been added. The blackened areas show the course of the fluid thru the organ. All figures are photographs.

Figure 1. Ventral surface of liver.

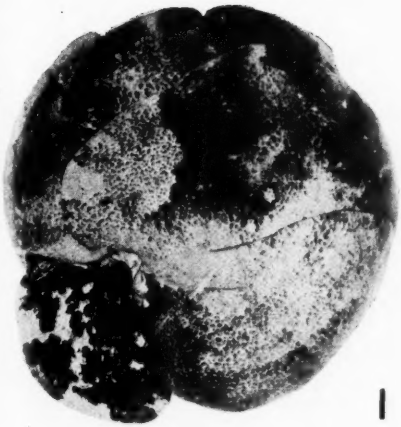
Figure 2. Dorsal surface of liver. Very little passed thru the left lobe.

Figure 3. Two pieces of a liver, showing a very incomplete perfusion.

Figure 4. Dorsal surface of liver. The fluid passed thru a relatively small area around the transverse fissure.

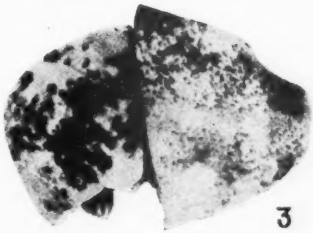
Figure 5. Section of a deeply blackened area from a liver, showing that even in this part not over half the hepatic cells are reached by the perfusing fluid.

Figure 6. Dorsal surface of lungs. Very incomplete perfusion of one lung.

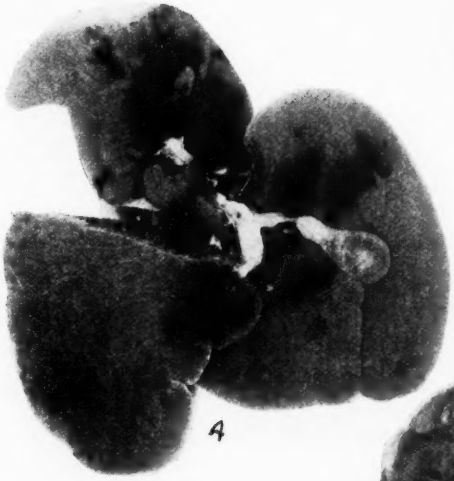


1

2



3



4

5

6

THE JOURNAL of the NATIONAL DENTAL ASSOCIATION

Entered as second-class matter, March 22, 1915, at the Post Office at Huntington, Indiana, under the Act of August 24, 1912. Published Monthly.

Editor and General Manager.
OTTO U. KING, D. D. S., 127 N. Dearborn St., Chicago, Illinois.
Associate Editors,
THOMAS P. HINMAN, D. D. S., Atlanta, Ga.
HARVEY J. BURKHART, D. D. S., Rochester, N. Y.
THOMAS B. HARTZELL, D. M. D., M. D., Minneapolis, Minn.

All expressions of opinion and all statements of supposed facts are published on the authority of the writer over whose signature they appear and are not to be regarded as expressing the views of the National Dental Association, unless such statements or opinions have been adopted by vote of the Association.

SUBSCRIPTION included in the annual membership dues.

SUBSCRIPTION, $2.00 a year, in advance, to non-members, living in all parts of the United States or its possessions. Canada, $2.40. Foreign countries, $2.75. Single copies, 20 cents.

ADVERTISEMENTS accepted only from reliable firms. Fraudulent and misleading advertisements barred.

IN CHANGES OF ADDRESS both the old and new address must be given.

JOURNALS are not sent beyond the subscription period.

ORIGINAL ARTICLES, items of news and matter of interest to the profession are welcome. Request for reprints should be made at the time of forwarding articles.

VOL. 6 MAY, 1919 NO. 5

Editorial Department.

EVERY CITIZEN SHOULD CONTINUE TO SUPPORT THE RED CROSS.

The American soldier and his family are still being mothered by the American Red Cross thruout the world.

The signing of the armistice has not released from duty thousands of soldiers stationed in camps at home and overseas. The American Red Cross is still on duty everywhere, for while the war is over the need for human sympathy and the relief of human suffering still exists.

Since the 11th of November the scope of American Red Cross service has broadened rather than narrowed. With the opening of countries long closed to all relief bringing agencies new fields for service unparalleled in the history of the world spread before the Red Cross. Now that the war emergency is over the new needs of humanity, even more terrible in the war after-math, remain to be met.

Red Cross relief work will ultimately cover the entire world according to plans for an international Red Cross to be completed at a conference of Red Cross officials of the Allied Nations to meet at Geneva, Switzerland, thirty days after peace is declared. Dr. Livingston Farrand, the president of the Central Committee of the American Red Cross, who is now in Europe in conference, is arranging with Red Cross officials from England, Japan, France, Italy and Belgium, for the effective administration of relief work on a tremendous scale. The ideal of the conference will be to work out a plan for the development of new fraternity and sympathy among the peoples of the world, and to devise a procedure whereby all peoples may cooperate actively in promoting the health and happiness of one another.

To quote President Wilson's words to H. P. Davison in regard to the entrance of the American Red Cross in the plans to unite the Red Cross societies of the world—"I share your belief that out of such a conference as this proposed an international relief organization would develop which must contribute to the welfare of mankind thruout the world."

Meanwhile, relief work for despairing peoples thruout the world is being undertaken by the American Red Cross. Before the registration of the War Council, the emergency body which directed American Red Cross, projects were launched to meet with dispatch the desperate needs of European peoples. For relief work in Poland, long closed to outside countries $2,000,000 has been appropriated to meet the need for wearing apparel among those making a brave effort to re-establish themselves in the recovered areas of Europe. Over 1,100,000 yards of textiles have been sent to France to be made up into clothing.

Red Cross workers here at home are working on a national quota of 1,000,000 ready-to-wear garments a month, to be shipped overseas by the middle of May. Supplementing this phase of relief work a campaign for the collection of used clothing is being carried on thruout the country.

At the request of General Pershing a commission has been appointed to help feed, clothe and care for the repatriation of Russian prisoners in Germany. In cooperation with French institutions, dispensaries and

visiting nurses are being supplied by the American Red Cross to meet the urgent need of the civilian population with special regard to the care of tuberculosis patients.

Even the Juniors are to have their share in carrying out this immense relief program. When you realize that 1,200,000 acres of forest land alone has been destroyed the need of lumber becomes evident. The Red Cross Juniors have undertaken to supply 30,000 chairs and 10,000 tables made in the manual training departments of the various schools thruout the country before the close of the school year. To meet the new demand for individual service 50 men and 200 women have been recruited recently for future war service overseas. The American Red Cross, mindful of the usual poverty and suffering in the United States, is working out an important plan to fortify the public health of the country. Red Cross nurses returning from overseas are to travel the Chautauqua circuits in this country teaching the people the great need of health care and proper food. Red Cross chapters are to become the centers for the advancement of the public health program.

In the government hospitals thruout the country, soldiers who have been invalided home are receiving under the direction of the American Red Cross preliminary work which will send them back to civil life with definite plans and hopes for the future.

Wherever the need for help, in the cases of families whose soldier or sailor is still in the service, is evident, the American Red Cross tides over the family and generally keeps things shipshape until the soldier or sailor can return and attend to his own affairs.

The dental officers returning from overseas work speak in highest praise of the noble and efficient work done by the American Red Cross. In many instances, dentists would have been unable to secure supplies had it not been for the unselfish cooperation of the Red Cross workers.

The war is over but the work of the American Red Cross is not completed. Indeed it seems just beginning.

The American Red Cross has done a noble work for humanity in this great war and every true American dentist will continue to loyally and unselfishly support the Red Cross in its future reconstruction plans following the declaration of peace.

The American Red Cross ideals of service to humanity must be perpetuated.

SURE—WE'LL HELP FINISH THE JOB.

Here are some of the reasons why you should buy all you possibly can of the Fifth Liberty Loan—the VICTORY LOAN.

1. Because you appreciate and are grateful for the Victory that has been won.

2. Because many of the boys who are coming back are sick and wounded and crippled and they and their dependents must be cared for.

3. Because one of the big things that made the Hun surrender, and thus saved thousands of American lives, was that Uncle Sam had made immense preparations for the Spring drive, and the Huns knew that this meant defeat for them. Much of this preparation was made on credit and Uncle Sam must now sell the Victory Loan to pay his bills.

4. Because Uncle Sam has either to borrow the money he needs from his people thru the VICTORY LOAN or to tax them to get it. Every subscription to the VICTORY LOAN prevents bigger taxes.

5. Because the success of the VICTORY LOAN will prove to the world that we are united people in Peace as well as in War. It will give a crushing blow to every form of disloyalty and the waving of the red flag in America.

6. Because the money raised by the VICTORY LOAN is to be spent in America for the benefit of American industries, for wages and salaries to American men and women, and all this means continued prosperity and a happy country for us and for our children.

We really can never fully pay the debt that we owe to our brave boys, but at least we can lend our every available dollar to help make America a better place than ever in which they may live and be happy.

No dentist should put off buying his full share of the VICTORY LIBERTY LOAN.

RECENT PATENTS RELATING TO DENTISTRY.

1293627, Artificial denture, Frederick U. Bowers, San Francisco, Cal.
1293358, Dental laboratory instrument, James S. Davidson, Wheeling, W. Va.
1293049, Centrifugal casting, Dimitri S. De Lavaud, New York, N. Y.
1293567, System for dental charts and making the same, Frederick L. Stanton, New York, N. Y.
52957, Design, Chemist's mortar, James H. Hurtt, Jr., Philadelphia, Pa.
1293662, Apparatus for casting cementitious material, Grosvenor Atterbury, New York, N. Y.
1294355, Dental filling and making same, Horatie A. Black, Topeka, Kans.
14589, Reissue, Tooth-brush, Alba C. Booth, Burlington, Vt.
1293860, Collapsible container, Hugo Mock, New Brighton, N. Y.
1293887, Broach, John Oakley, Springfield, Mass.
1293950, Clasp for plates or removable bridges, Wm. F. Shaw, Pueblo, Colo.
1293998, Attachment for dental engines, Frank G. Wagner, Los. Angeles, Cal.
1294423, Dental tool, Charles H. Davis, deceased, Worcester, B. D. Davis, Executrix, Boston, Mass.
1294658, Cap remover, Dodson Haslup, Grafton, W. Va.
1295433, Appliance for expressing the contents of compressible tubes, Walter Chipperfield, Great Nelmes, England.
1295244, Constructing and connecting artificial teeth, Henry J. Warren, Bayonne, N. J.

Copies of above patents may be obtained for fifteen cents each, by addressing John A. Saul, Solicitor of Patents, Fendall Building, Washington, D. C.

Army and Navy

TREASURY DEPARTMENT.

Office of the Collector of Internal Revenue, Chicago, Ill.

March 24, 1919.

Dear Sir:

By the Revenue Act of 1918, Sections 1 and 6, of the Harrison Narcotic Law were amended; revising special tax for persons registered under the law as follows:

Class 1.—Importers, Manufacturers, Producers, and Compounders (persons who import, manufacture, compound or otherwise produce for sale or distribution narcotic drugs and preparations), $24.00 per annum.

Class 2.—Wholesale Dealers (persons who sell or offer for sale narcotic drugs and preparations in original stamped packages), $12.00 per annum.

Class 3—Retail Dealers (persons who sell or dispense narcotic drugs and preparations from original stamped packages), $6.00 per annum.

Class 4.—Practitioners (physicians, dentists, veterinary surgeons and other practitioners lawfully entitled to distribute narcotic drugs; hospitals, sanitariums, and educational institutions included in this class), $3.00 per annum.

Class 5—Dealers in untaxed narcotic preparations (persons who sell preparations of any kind containing narcotic drugs in a quantity exempted from payment of tax), $1.00 per annum.

You will be sent bill shortly for the proportional part of the tax for the period ending June 30th, 1919.

The amendments referred to above also impose a tax of 1c per ounce or fraction on opium, coca leaves, any compound, sale, derivative or preparation thereof; this tax to be paid by the manufacturer, importer, producer, or compounder. All persons in class 1 ($24.00 class) are hereby directed to stamp every individual bottle, package, tube or other container of narcotic drug or preparation with revenue stamps now to be had at this office in denominations of from 1c and up.

All persons registered under the Harrison Narcotic Law other than those in class 1 and 5 above, must affix at once to each broken or unbroken individual bottle or other container of unstamped narcotic drugs and preparations, their own label or paster, with the words: "In stock inventory Feb. 25th," and initials of owner in order to avoid possible seizure.

Respectfully,

JULIUS F. SMIETANKA,

ECA Collector.

Note: A retail dealer must pay an additional tax as wholesale dealer if narcotics are sold in stamped packages.

IN REPLY REFER TO S.G.O. L°EHV

WAR DEPARTMENT
OFFICE OF THE SURGEON GENERAL
WASHINGTON

February 5, 1919.

Dr. J. W. Beach, Pres.,
Preparedness League of American Dentists,
Buffalo, New York.

Dear Doctor:

Having been advised of the gratuitous services rendered by the members of the Preparedness League of American Dentists in assisting to make dentally fit the Selective Service men after they had been accepted by their Local Boards and previous to their induction into military service, and having learned that about half a million dental operations were performed by members of this organization for those entering military service without expense to the Government or the soldier, I desire to convey to you, the President, and through you to the remaining Officers and members by either letter or in person, my sincere appreciation of the patriotic services rendered.

Very truly yours,

M. W. Ireland
Surgeon General, USA.

ALL COMMUNICATIONS SHOULD BE ADDRESSED TO "THE SURGEON GENERAL, U. S. ARMY, WASHINGTON, D. C."

INCREASED HARRISON LAW TAX UNJUST TO PHYSICIANS.

While the Harrison law for the control of narcotic drugs was passed ostensibly for the purpose of raising revenue, it is in reality a public health measure. The revenue feature is only a legal subterfuge, as it was only by imposing a tax that Congress could exercise any jurisdiction on the question. The tax, therefore, being merely a pretext, should be a minimum and purely nominal one. Originally the law required physicians who desired to prescribe the drugs covered by the act to pay an annual registration fee of one dollar. There are approximately 150,000 physicians in the United States. The law, therefore, imposed a tax of $150,000 on the medical profession for the protection of the public. This tax, physicians cheerfully pay accepting this small burden for the sake of the public benefits to be derived from the measure. However, at the last session, Congress in the revenue law, increased the fees for registration under the Harrison Law. The license fee for physicians was increased to three dollars. This means that physicians in the United States will be required during the next year to contribute nearly half a million dollars, purely for the public good and not in any sense for the benefit of the profession. The Harrison law is of no special benefit to physicians. The Journal, the American Medical Association and the American Medical profession enthusiastically supported the Harrison bill when it was before Congress. The great majority of the profession have cooperated to the extent of their ability to promote the enforcement of the law. The nominal tax of one dollar was accepted by physicians to validate the measure. But there is not the slightest excuse, either legal or social, for increasing this fee to three dollars. If the expenses of administering the law are greater than the revenue derived from it, sufficient appropriation should be made out of the public money derived from general taxation. The law is for the benefit of the public and the public should pay for it. It is, of course, too late to secure any change in the situation for the present year, but the law should be amended at the first opportunity by restoring the nominal tax of one dollar. If our state and county societies will bring this situation to the attention of their congressmen and will demand the amendment of the present law speedy correction of the injustice done the profession will be possible.—*Editorial, Journal of A. M. A.*

CANTEEN SERVICE.

Do you know that there are more than 700 Red Cross Canteens in operation at piers and railroad terminals in the United States, with more than 50,000 women serving?

Do you know that 2,339,000 canteen services were performed in one month, and that there were distributed:

1,000,000 sandwiches.
3,500,000 cigarettes.
1,000,000 postcards.
100,000 pieces of reading matter.
328,000 bars of chocolate.
96,000 free meals served to men in transit.

Also large quantities of candy, fruit, cakes, pies, ice-cream cones, stamps, soap, matches and comfort kits.

"THE DEATH TRAIN," HARROWING TRUE STORY OF RUSSIA TODAY.

Stark realism reminiscent of the old school of Russian fiction makes the fact story, "The Death Train," in the April number of the Red Cross Magazine, which shows the terrible state into which great Russia has fallen. Simply reproduced from his diary, written while the scenes were still burning themselves into his mind, Rudolph Bukeley's description

of the trainload of diseased, crazed, dying and dead prisoners, dragged madly over into Siberia with no destination, in cars reeking with filth, appalls even those who know what Siberia is today. Eight hundred of the poor wretches died before the American Red Cross workers could do anything against the panic and chaos that accompanied the train.

"I have seen the dead," writes Bukeley, who was one of the Red Cross workers on the spot, "thru whose bodies disease and vermin have eaten their way until life itself has departed after five months of daily, agonizing torture from hunger, filth, exposure. I have seen thru the windows of box-cars whose dimensions were 24x10, containing 40 animals that once were human—men, women and children; faces that when they glare at me I could not recognize as those of human beings, but who resembled beasts of a species unknown to man. I have seen the dead lying along the roadside and fifty or sixty men fighting like dogs for pieces of bread thrown to them by the sympathetic poor people of Nikolsk. And the sights I have seen will be duplicated all over Siberia, and thousands, aye, tens of thousands, will literally rot to death. I use the words advisedly, for human life is the cheapest thing in Siberia."

RED CROSS NURSE FIRST WOMAN TO RECEIVE D. S. C.

The first woman in America to receive the Distinguished Service Cross is Miss Beatrice Mary MacDonald, a Red Cross nurse assigned to the Army Nurse Corps, who remained at her post thruout a German air raid until a fragment of shell struck her in the face, destroying her right eye.

Miss MacDonald was in an evacuation station immediately behind the lines on the night of August 17, 1917, when many of the wounded were killed.

The Distinguished Service Cross is the highest award for bravery which can be bestowed outside of the Congressional Medal, and Miss MacDonald is said to be the first woman so honored by the government. Secretary of War Baker made the award "For extraordinary heroism against an armed foe."

DENTAL CORPS ORDERS FROM WAR DEPARTMENT.

DENTAL CORPS.

Maj. Edward F. Lafitte to St. Louis, Mo., general hospital 40, for duty.

The following to Hawaiian Department for duty: Maj. Wilfurth Hellman, Capts. Jerome L. Fritsche and Clement J. Gaynor, 1st Lieuts. Howard C. Feyler and John R. Wikeen.

Capt. Page P. A. Chesser to Colonia, N. J., general hospital 3, for duty.

Capt. Thomas M. Terry to St. Louis, Mo., general hospital 40, for duty.

Capt. John J. W. Ross to Camp Lee, Va., for duty.

Capt. Howard A. Hale to San Francisco, Letterman General Hospital, for duty.

Resignation by 1st Lieut. Carl H. West (Regular Army) accepted.

—Army and Navy Register, March 29.

Majs. Leigh C. Fairbank and Samuel J. Randall from Philippine Department to San Francisco and report for instructions.

Maj. Wm. A. Heckard, Capts. Dudley C. Hughes and Harry R. Rice to Hoboken, N. J., port of embarkation, for duty.

Capt. Harold J. Parker and 1st Lieut. Wm. F. Wieck to Philippine Islands for duty.

—Army and Navy Register.

Maj. Howard I. Benedict to Fort Oglethorpe, Ga., general hospital 14, for duty.

Maj. John H. Snapp to Fort Sheridan, Ill., general hospital 28, for duty.

Capt. Fletcher D. Rhodes to Jefferson Barracks, Mo., for duty.

Capt. Harry C. Ments to Hoboken, N. J., port of embarkation, for duty.

—Army and Navy Register, April 5.

Lieut. Col. Rea P. McGee to St. Louis, general hospital 40, for duty.

Capt. Charles Van B. Beard to Denver, Colo., general hospital 21, for duty.

Capt. Charles L. Andrews to Fort Douglas, Utah, general hospital 27, for duty.

—Army and Navy Register, April 19.

NATIONAL DENTAL ASSOCIATION.

To our esteemed professional colleagues:

The undersigned who practice in Madrid and who are imbued with the ideas of right and justice for which the Allies have fought and suffered during this war, are holding a dinner at which we are toasting the long desired victory and peace and at the same time we send you a message of heartiest congratulation.

Altho far distant from the battle line and altho we have not suffered and sacrificed as you have done, our hearts and souls have been with you in the bitter hours as in the glorious hour of victory and we have always been serene in the faith that you would finally triumph.

We have admired the unselfish devotion of our profession, exemplified by you, to the needs of the army, all of which have raised the standard of our profession, and in these historic days we unite in saluting in your flag, the symbol of the heroism of the nation, and as companions we repeat the sincere testimony of our esteem.

Signed by authority

Blas Mousalve
S. Kuper
E. Brotons Bonet
Adolfo Damians
Damians Colomer
Ramon Pons
Julian de Arino
Emilio Castiguera
Rafael Viñas
José Font
Blas Martinez
Licinio Avila
Rodriguez Bustos
Jaime B. Villerid
Ignacio Giraud
A Cherriguian
Manuel Bau

Enrique Lordá
M. Tolleado
Manuel Palacios
Vicente Mollar
Juan Alcina
Luis Aupié
Rafael Pastor
Remigio Guemon
Ricardo Ramirs
J Clavero
Ignacio Mendizabal
Abilio Saenz
Andres Vizcaino
E Mitchell
Fernando Cereceda
Suarez Jarza
C. Sevilla

WOUNDED MEN SEE NEW YORK.

With New York society women acting as guides the wounded men in New York are being entertained these fine spring afternoons by "bus" tours around the city. The idea originated at the Red Cross Shop, which is conducted for the benefit of the convalescing soldiers and sailors in local hospitals.

The Red Cross women managing the shop have arranged to take about eighty men each day. They are accompanied by four of the society women, who point out centers of interest. Some of the trips are thru the financial district and along the Southern waterfront, while others are thru Fifth avenue and Central Park. The boys always want to see the houses the national captains of industries and the big financiers call home.

MILITARY DISCIPLINE.

It is not difficult to get potatoes peeled in the army. It is extremely difficult to build up discipline in the army. Discipline has to be cultivated sedulously. Half of the soldier's training has nothing to do with the technical skill required to operate the devices of his arm. It has solely to do with discipline.

Discipline is as easy to destroy as it is difficult to upbuild. The destruction begins by refusing to peel potatoes. Insubordination is contagious. The man who refuses to peel potatoes, and gets away with it, may lose the next battle. He has wrecked discipline in his organization. He has brought to the surface the hundreds of individual desires which have been suppressed by careful training. He has undone the work of months.

Military justice thinks about the nation first, because the penalty of military failure is unthinkable. Civilian thought does not understand, because civilian thought is concerned with the individual who has committed a crime more than the effect of the crime on the nation. No direct result of unpunished murder is seen. A direct result of disobedience in the army is not only seen but it is felt. Disobedience nullifies an army. It is better to have no army than to have an undisciplined army. That is why disobedience, even when it concern only peeling potatoes and smoking cigarettes, is and always must be punished quickly and effectively in an army at war.

It is not a question of Prussianized officers against a poor inoffensive individual. It is a question of the individual against the nation. The citizen in peace time does not think about the nation. He thinks about individuals. Army law is thinking about the nation, and the civilian does not understand it. — *Chicago Tribune.*

13,101 MEN NEED DENTIST. 1,577 EMERGENCY CASES.

Reports collected by Capt. Huber, divisional dental surgeon, show that of the 26,437 men in the division 13,001 need dental attention, while the other 13,436 are in good shape. Of these 1,577 are emergency cases and 7,467 need extractions or other painful operations. The rest are for simple cleaning. These records were pulled down by the 57th Artillery Brigade. Its men spent more than five months on the line and had very little time for dental care.— *Over Seas Edition of Camp Dodge Paper.*

NATIONAL SOCIETIES, 1919.

October.

20-24—New Orleans, National Dental Association.

20-24—New Orleans, National Association of Dental Faculties.

20-24—New Orleans, National Association of Dental Examiners.

20—New Orleans, Delta Sigma Delta.

20-24—New Orleans, Xi Psi Phi Fraternity.

20-24—New Orleans, Association of Military Dental Surgeons.

17-18—New Orleans, International Society of Prosthetists.

20-24—New Orleans, Psi Omega Fraternity. Grand Chapter meeting and National Alumni Chapter meeting.

STATE SOCIETIES.

May.

13-14-15-16—Illinois, Peoria.
19—Arkansas, Pine Bluff.
20-21-22-23—Indiana, Indianapolis.
20-21-22—Nebraska, Omaha.
California Southern, Los Angeles.
North Dakota, Fargo.

June.

9-10-11-12—Kentucky, Louisville.
11-12-13—Georgia, Savannah.
12-13-14—New York, Syracuse.
18-19-20—Florida, Tampa.
18-19-20—New Hampshire, Manchester.
19-20-21—Colorado.
19-20-21—South Carolina, Columbia.
23-24-25-26-27-28—California, San Francisco.
25-26-27—North Carolina, Asheville.
26-27-28—New Mexico, Albuquerque.
Maine. Place to be announced.
Maryland, Baltimore.
Utah, Ogden.

July.

8-9-10—Wisconsin, Milwaukee.
14-15-16-17—Washington, Seattle.
16-17-18—New Jersey, Atlantic City.
24-25-26—Montana, Butte.

September.

4-5-6—Tennessee, Nashville.

October.

21—Louisiana, New Orleans.
Rhode Island, Providence.

December.

2-3-4—Ohio.

DATES TO BE ANNOUNCED.

Arizona, Phoenix.
Virginia, Richmond.

SEMI-ANNUAL MEETING OF THE RHODE ISLAND BOARD OF REGISTRATION IN DENTISTRY.

The regular semi-annual meeting of Rhode Island Board of Registration in Dentistry for the examination of applicants will be held in the State House, Providence, R. I., July 1st, and, 3rd, 1919. All applications with proper fee must be filed one week previous. For further information address,

ERNEST A. CHARBONNEL, Sec'y,
334 Westminster Street,
Providence, R. I.

TENNESSEE STATE DENTAL ASSOCIATION.

The fifty-second annual meeting of the Tennessee State Dental Association will be held at the Hotel Hermitage, Nashville, September 4-5-6, 1919.

JAMES J. VAUGHN,
Chairman Publicity Committee,
Nashville, Tenn.

CONNECTICUT DENTAL COMMISSION

The Connecticut Dental Commission will meet at Hartford, June 19th, 20th and 21st, to examine applicants for license to practice dentistry, to examine applicants for dental hygienist's license and to transact any other business proper to come before said Commission.

For further information, address
EDWARD EBERLE, Recorder,
902 Main St., Hartford, Conn.

MARYLAND BOARD OF DENTAL EXAMINERS.

The Maryland Board of Dental Examiners will meet for examination of candidates for certificates on June 10 and 11 at the Dental Department of the University of Maryland, Baltimore, at 9 A. M.

For application blanks and further information apply to

F. F. DREW, Secretary,
701 N. Howard Street, Baltimore.

NEBRASKA BOARD OF DENTAL SECRETARIES.

The Nebraska Board of Dental Secretaries will hold its examination as follows: the practical work at the Creighton Dental College, Omaha, June 2-3, and the theoretical work at the Capitol Building, Lincoln, June 4-5-6. A special examination is being arranged for about one month later.

Yours truly,
S. A. ALLEN, Secretary.

NEXT MEETING OF THE NATIONAL DENTAL ASSOCIATION, NEW Orleans, La., Oct. 20-24. '19.

Ignorance has been and is the deadliest enemy of civilization.

It has cost more lives, wrecked more homes, and shattered more happiness than all the wars conducted by all the tyrants since the beginning of time.

Only in modern times have men been able to develop a real defense against the terrific toll of human life.

So far this defense has only been builded in small part. It will remain for the professional men of this and other Countries to go on with the fight.

How many people in your community know the real value of the conservation of teeth or the effect of their decay on health?

Dentists must broaden the scope of education which the War started.

The next meeting of the National Dental Association will be held in New Orleans, Louisiana, October 20, 21, 22, 23 and 24, 1919.

C. V. VIGNES, President.
J. P. WAHL,
Chairman Local Committee.

DENTAL ALUMNI SOCIETY OF THE UNIVERSITY OF PENNSYLVANIA.

The annual meeting of the Dental Alumni Society of the University of Pennsylvania will be held on Friday, June 13, 1919. The business meeting of the Society will be held in the Lecture Room, Evans Institute, 40th and Spruce Sts., at 10 A. M. An interesting series of clinics will be given in Clinic Hall, 2 P. M. The annual dinner of the Society will be held, Hotel Adelphia, 6:30 P. M. There will be reunions of classes '99, '09, '14 and others.

For further information, address,
Z. T. JACKAWAY, Sec'y-Treas.,
1506 E. Susquehanna Ave.,
Philadelphia, Pa.

IOWA STATE BOARD OF DENTAL EXAMINERS.

The next meeting of Dental Examiners for the examination of candidates for licenses will be held in Iowa City at the College of Dentistry, commencing Wednesday, June 18, 1919, at 9 A. M.

For application blank and information address,

DR. J. A. WEST, Sec'y,
805 Pleasant St., Des Moines, Ia.

COMMITTEE OF DENTAL EXAMINERS—ILLINOIS.

The next meeting of the Committee of Dental Examiners for the examination of applicants for license to practice dentistry in Illinois will be held in Chicago, the week commencing Monday, June 23. For application blank and further information, address the Department of Registration and Education, Springfield, Ill.

MICHIGAN STATE BOARD OF DENTAL EXAMINERS.

The next meeting of the Michigan State Board of Dental Examiners will be held at the Dental College, Ann Arbor, Mich., June 16-23, 1919. Applications for examination must be in the hands of the Secretary ten days before the meeting. For information address B. S. Sutherland, Sec'y-Treas., Owasso, Mich.

MEETING OF THE TENNESSEE STATE BOARD OF DENTAL EXAMINERS.

The next meeting of the Tennessee State Board of Dental Examiners will be held in Nashville, Tenn., June 30th, 1919, for the examination of candidates for registration.

All applications must be in the hands of the Secretary on or before the 20th of June. For further information address F. W. Meacham, Secretary, 911-12 Hamilton National Bank Bldg., Chattanooga, Tenn.

OHIO STATE DENTAL BOARD.

The Ohio State Board of Dental Examiners will hold their regular examination for applicants who desire to practice dentistry in Ohio at the Ohio State University the fourth Monday of June, 1919, examination will begin at 8 o'clock A. M.

Applications must be in the hands of the Secretary by June 12th.

A. F. LINSCOTT, President,
Marion, Ohio.
HOLSTON BARTILSON, Secretary,
150 E. Broad St., Columbus, Ohio.

THE FLORIDA STATE BOARD OF DENTAL EXAMINERS.

The Florida State Board of Dental Examiners will hold their regular annual examination at Tampa, Florida, beginning June 13th.

All applications and credentials with fee should be in the hands of the Secretary at least ten days before examination.

For further information and application blanks address R. P. Taylor, 414 St. James Bldg., Jacksonville, Fla.

THE DENTAL SOCIETY OF THE STATE OF NEW YORK.

The Dental Society of the State of New York will hold its 51st annual meeting June 12, 13, 14, 1919, at the Hotel Onondaga, Syracuse, N. Y. All ethical dentists, residents of New York and those residing in adjoining states are cordially invited to be present at the sessions of the Society.

Dr. A. C. Bickelhaupt, City Bank Bldg., Syracuse, N. Y., is Chairman of the Exhibits Committee.

A. P. BURKHART, Secretary,
52 Genesee St., Auburn, N. Y.

NORTHERN OHIO DENTAL ASSOCIATION MEETING.

The Northern Ohio Dental Association will meet in Cleveland, Ohio, June 2nd, 3rd and 4th, at Hotel Statler. In connection a Post-Graduate Course will be held from the 2nd to 6th, inclusive, consisting of the following:

"Nerve Blocking Anesthesia."

By Dr. Arthur E. Smith, of Chicago.

"Attachments to Vital Teeth."

By Dr. Edward Tinker, of Minneapolis.

"Prosthesis."

By Dr. M. M. House, of Indianapolis.

GEORGE B. SMITH, Sec'y,
Fremont, Ohio.

SOUTH CAROLINA STATE BOARD OF DENTAL EXAMINERS—CHANGE OF DATE.

The meeting of the South Carolina State Board of Dental Examiners has been postponed until June 30th. The examinations will begin promptly at 9 o'clock, Monday morning, June 30th, at Bamberg, S. C.

All applications must be in the hands of the secretary by June 20th.

Application blanks and further information may be obtained by addressing,

R. L. SPENCER, Secretary,
Bennettsville, S. C.

MEETING OF THE MAINE BOARD OF DENTAL EXAMINERS.

The Maine Board of Dental Examiners will hold their regular examination, beginning July 1st, 1919, at 8:30 at the State House.

All applications and fee of $20.00 must be in the hands of the Secretary by June 21st.

The examination for Dental Hygienists will be given at the same time, fee $10.00.

WILL S. PAYSON, Secretary,
Castine, Maine.

ANNUAL MEETING OF THE CALIFORNIA STATE DENTAL ASSOCIATION.

The 1919 session of the California State Dental Association will be held at the University of California, San Francisco, Cal., June 23, 24, 25, 26, 27 and 28. The meeting will be conducted on the post-graduate plan. Members of other Associations are invited providing their 1919 dues are paid and that they shall pay the special fee for that course in which interested. For further information, address the Secretary, J. E. Gurley, 350 Post St., San Francisco.

Very truly yours,
CALIFORNIA STATE DENTAL ASSOCIATION.
John E. Gurley, Secretary.

MISSOURI DENTAL BOARD.

The Missouri Dental Board will hold their regular examination for examining applicants to practice dentistry in Missouri at Jefferson City, on Monday, Tuesday, and Wednesday, June 9-10-11, beginning at 8 o'clock A. M. on Monday.

The practical examination will also be given at the Kansas City Colleges on Monday and Tuesday, May 5th and 6th, and at the St. Louis Colleges on Friday and Saturday, June 6th and 7th.

It is much more convenient for the applicants to take the practical examination at the Colleges. The practical examination will also be given at Jefferson City.

V. R. McCUE, Secretary,
Cameron, Mo.

THE INTERNATIONAL SOCIETY OF PROSTHETISTS.

The International Society of Prosthetists will hold their annual meeting in New Orleans, La., October 17-18, 1919.

DAYTON D. CAMPBELL, Secretary,
Kansas City, Mo.

NORTHERN OHIO DENTAL SOCIETY.

Northern Ohio Dental Society will meet June 2nd, 3rd and 4th, at the Hotel Statler, Cleveland, Ohio.

GEO. B. SMITH, Sec'y.

OKLAHOMA STATE BOARD OF DENTAL EXAMINERS.

The next meeting of the Oklahoma State Board of Dental Examiners will be held in the Senate Chamber, State Capitol Building, Oklahoma City, on July 14th, 1919.

A recent law enacted provides for an annual license fee of $1.00 and further provides that failure to pay automatically cancels the license to practice in the state.

For further information address,

H. R. WATKINS, Secretary,
240 American Nat'l Bank Bldg,
Oklahoma City, Okla.

THE BOARD OF DENTAL EXAMINERS OF ALABAMA.

The Board of Dental Examiners of Alabama will hold an examination for certificates in the Birmingham Dental College June 16th. Application blanks must be filled and in the hands of the Secretary not later than June 2nd. For full information write

DR. A. K. PARKS, Sec.-Treas.,
412-14 First Nat'l Bank Bldg.,
Montgomery, Alabama.

WEST VIRGINIA STATE BOARD OF DENTAL EXAMINERS.

The next meeting of the West Virginia State Board of Dental Examiners will be held in Wheeling, W. Va., beginning at 9 o'clock on Tuesday morning, June 24th, 1919. For further information and application blanks address,

R. MASON HITE, Sec'y,
Mannington, W. Va.

INDIANA STATE BOARD OF DENTAL EXAMINERS.

The next meeting of the Indiana State Board of Dental Examiners will be held at the State House, Indianapolis, June 23rd to 28th, inclusive. For application and instructions write to H. C. McKittrick, Secretary-Treasurer, 605 Hume Mansur Building, Indianapolis.

Yours very truly,
H. C. McKITTRICK, D. D. S.

SOUTH DAKOTA STATE BOARD OF DENTAL EXAMINERS.

The next meeting of the South Dakota State Board of Dental Examiners will be held in Sioux Falls, South Dakota, June 25th, 26th, 27th, 1919, beginning promptly at 9:00 A. M. June 25th.

All applications must be in the hands of the Secretary by June 20th. Fee for examination, $25.00. No reciprocity or interchange. Full information and application blanks may be received by addressing,

L. S. SPENCER, Secretary,
Watertown, South Dakota.

ANNUAL MEETING OF THE WYOMING BOARD OF DENTAL EXAMINERS.

The annual meeting of the Wyoming Board of Dental Examiners will be held at Cheyenne, Wyoming, on the last Tuesday of June, the 24th to 27th inclusive.

For further information and application blanks, address Peter Appel, Jr., Secretary, P. O. Box, 643, Cheyenne, Wyoming.

ANNUAL MEETING NEW MEXICO DENTAL SOCIETY.

The next meeting of the New Mexico Dental Society will be held in Albuquerque, June 26, 27 and 28, 1919.

J. J. CLARKE, Secretary,
Artesia, New Mexico.

ANNUAL MEETING SOUTH CAROLINA STATE DENTAL ASSOCIATION.

The annual meeting of the South Carolina State Dental Association will be held in Columbia, South Carolina, June 19, 20, 21. The place is South Carolina University Campus.

ERNEST C. DYE, Secretary,
Greenville, S. C.

NEW JERSEY STATE DENTAL SOCIETY.

The forty-ninth annual convention of the New Jersey State Dental Society will be held on July 16-17-18, 1919, on Young's Million Dollar Pier Atlantic City, N. J.

The entire convention will be held on the Pier. Machinery Hall will be used for the exhibits. Those who attended last year will remember the magnificent display of dental goods, and Dr. W. W. Hodges of Perth Amboy, N. J., chairman of the Exhibit Committee, with 25,000 square feet of space, has promised an exhibit greater than that of 1918. Dr. Angelo Zabriskie of Ridgewood, N. J., as chairman of the Clinic Committee, has arranged for a program of clinics that will prove of great interest.

The Essay Committee under the direction of Dr. Edward L. Wharton of Newark, will present essayists of prominence—names and subjects to be announced.

All meetings for the presentation of papers as well as the business meetings will be held in the Greek Temple, out on the pier.

The headquarters of the Society will be at the pier entrance. Mail may be directed to exhibitors, clinicians, or members, in care of the Secretary New Jersey State Dental Society, Young's Million Dollar Pier.

A list of hotels where special rates may be secured will be published in the New Jersey Dental Journal prior to the convention, or may be secured by addressing the secretary.

A cordial invitation is extended to ethical practitioners.

JOHN C. FORSYTH, Sec'y.,
430 E. State St., Trenton, N. J.

VIRGINIA STATE BOARD OF DENTAL EXAMINERS.

The next meeting of the Virginia State Board of Dental Examiners will be held in Richmond, Va., beginning at 9 o'clock on Tuesday morning, June 24th, 1919.

For further information and application blanks address:

J. LEWIS WALKER, Sec'y,
505 Taylor Bldg., Norfolk, Va.

MISSISSIPPI BOARD OF DENTAL EXAMINERS.

The next meeting of the Mississippi Board of Dental Examiners will be held in the Senate Chamber, State Capitol, Jackson, Miss., on the third Tuesday in June. For application blanks and further information address,

B. J. MARSHALL, Secretary,
6-7 Turner-Cox Bldg., Marks, Miss.

MEETING OF THE VERMONT BOARD OF DENTAL EXAMINERS.

The next meeting of the Vermont Board of Dental Examiners, for the examination of candidates to practice in Vermont, will be held at the State-house, Montpelier, commencing at 2 P. M. on June 30th, 1919, and continuing for three days.

To be eligible for examinations a candidate must be (1) twenty-one years of age, (2) A graduate of a high school of the first class, and (3) a graduate of a reputable dental college.

Applications must be in the hands of the Secretary not later than June 21st.

For further information apply to

HARRY W. HAMILTON, Sec'y,
Newport, Vermont.

ANNUAL MEETING OF THE NORTH CAROLINA STATE SOCIETY.

The North Carolina Dental Society will hold its next annual session, June 25, 26 and 27 at Asheville, N. C. Headquarters Battery Park Hotel.

W. T. MARTIN, Secretary,
Benson, N. C.

ANNUAL HOME-COMING CLINIC.

The Northwestern University Dental School Annual Home-coming Clinic will be held June 16th and 17th. A splendid program has been arranged for each day, covering subjects of vital interest in the practice of modern dentistry.

For information please communicate with the secretary of the alumni association. M. M. PRINTZ, Chicago,
25 E. Washington St.

BOARD OF DENTAL EXAMINERS OF CALIFORNIA.

The next meeting of the Board of Dental Examiners of California for the purpose of examining applicants for a license to practice dentistry in this state will be held in the City of San Francisco beginning on the 5th day of June, 1919, at 9:30 A. M. This examination will be followed by an examination to be held in the City of Los Angeles, beginning on the 14th day of July, 1919, at 9:30 A. M. Each applicant shall file with the Secretary of the Board, at least ten days before the date selected for each examination, the following credentials: (1) diploma or certificate of graduation from a reputable dental college approved by the Board; (2) a diploma from an accredited high school or a certificate signed by a State Superintendent of Public Instruction (or similar officer) to the effect that the applicant has had scholastic preparation equivalent in all respects to that demanded for graduation from a high school giving a four year course of instruction in the state from which such certificate is issued. (A certificate signed by a deputy Superintendent or an examiner for entrance to a dental college will not be accepted by the Board.) An applicant who has been a licensed practitioner of dentistry of some other state of the United States for a period of at least five years, shall file such license or licenses which will be accepted in lieu of the high school credentials; (3) testimonial of good moral character; (4) a recent unmounted photograph of the applicant.

For further information, address the Secretary,

C. A. HERRICK, D. D. S.,
133 Geary St.,
San Francisco, Calif.

NEW JERSEY BOARD OF REGISTRATION.

The State Board of Registration and Examination in Dentistry of New Jersey will hold their regular examination in the State House, Trenton, New Jersey, on June 23, 24, 25, 26, 27. License fee, $25; re-examination fee, $10. Practical tests required. Insertion of an approximal gold filling, with approximating tooth in position, compound approximal amalgam filling, a silicate filling, practical test of the applicant's ability in oral prophylaxis, and preparation of a cavity for an inlay with wax pattern. Also the soldering of a bridge consisting of three or more teeth exclusive of abutments, and one Richmond Crown, which may be one of the abutments of the bridge; these must be struck from dies made from an impression of the mouth, and the articulating model, with the bridge, when soldered, must be submitted for inspection. An anatomical articulation of a full upper and lower set of teeth will also be required; teeth to be furnished by applicant. Wax bite properly trimmed and in place on models for inspection before setting up teeth.

Attention is directed to the following

quotation from the dental law of New Jersey:

"Applicant shall present to said Board a certificate from the Commissioner of Education of this State, showing that before entering a dental college he or she had obtained an academic education consisting of a four-year course of study in an approved public or private high school, or the equivalent thereof." In accordance with this law the Secretary will issue application blanks only upon presentation of the required certificate from the Commissioner of Education, State House, Trenton, New Jersey.

Note—Dental Radiography will be added to the list of theoretical examinations in June, 1919.

Applications must be filed complete ten days before the date of the examinations. Address all communications for further particulars to

JOHN C. FORSYTH, Sec'y,
430 East State St., Trenton. N. J.

New Jersey State Board Announces Changes in Requirements, Beginning December, 1919.

The December Examination of the State Board of Registration and Examination in Dentistry of New Jersey will be held for five days commencing the first Monday in the month. At that time the theoretical prosthetic and the present practical prosthetic examinations will be dispensed with, and in place thereof a practical prosthetic examination will be given as follows:

Taking of impression, bite, selection of teeth, articulation, trial plate. Soldering of Richmond Crown, which must be made from an impression of the mouth and the articulating model, with the crown, when soldered must be submitted for inspection. Oral theoretical examination to be given at the chair.

The theoretical examination in Metallurgy will be merged with Chemistry and consist of five questions.

A practical examination in mouth diagnosis will be added to the requirements.

OKLAHOMA STATE BOARD OF DENTAL EXAMINERS.

Information Regarding Examinations in the State of Oklahoma, and Rules Governing Them.

Applications.

Rule I. All persons who wish to practise dentistry in this State must fill out and send to the Secretary of this Board an application, a blank form of which will be furnished by the Secretary.

Rule II. In the case of those wishing to take the examination under the terms of reciprocal contracts existing between this and other States the application must be accompanied by a reciprocity certificate from the Board of Dental Examiners from the other State.

Rule III. In all other cases the application must be accompanied by the applicant's dental diploma.

Rule IV. The applicant under Rule III must also present with his application and dental diploma (or college certificate) his High School diploma. This must be from an accredited high school, or from a college or university of at least equal standard, and must represent four years of study, and an earning in credits of at least 15 units; a unit being a study persued for a year with five recitations each week.

Nine of these units MUST be from the following subjects:

English Grammar and Rhetoric, Composition and Literature, three units required, four allowed; Latin, two units required, three or four allowed (one year's work in German or French may be substituted for the second year in Latin); Geometry, one unit required, one and one-half allowed; Algebra, one unit required, one and one-half allowed; Physics, one unit; Chemistry, one unit.

The remaining six units may be from the following subjects:

Histology, one, two, or three units allowed; Botany, half unit; Zoology,

half unit; Physical Geography, half or one unit; Trigonometry, half unit; Drawing, half unit; German, two units; French, two units; Manual Training, one unit. A year's work in a dental office may be substituted for manual training. In ALL cases the applicant must present a certificate of moral character.

Dental Diploma and literary credentials may be shown the Board when applicant presents himself for examination.

Rule V. All applications and credentials should be in the hands of the Secretary at least ten days before the date of the examination.

Fees.

Rule VI. The fee for all examinations, including those examined under reciprocal contracts with other States, is $25.00.

Rule VII. The fee for re-examination, in case of failure to pass, is $10.00.

Rule VIII. No fee will be returned to an applicant after he has filed his application and entered upon his examination.

Examinations.

Rule IX. Theoretical. The examinations shall be written or oral or both, in the following subjects: Anatomy, Histology, Physiology, Chemistry, Oral Surgery, Pathology, Bacteriology, Materia Medica and Therapeutics, Orthodontia, Operative Dentistry, and Prosthetic Dentistry, Crown and Bridge-work and Metallurgy.

Rule X. Practical Operative Dentistry. Each applicant must come prepared to insert gold inlays, gold amalgam and silicate fillings. Each cavity, when prepared, must be inspected by the Examiners before the filling is inserted. Patient and operating chair will be furnished by the Board, but all materials and instruments (including dental engine) must be supplied by the applicant.

Rule XI. Practical Prosthetic Dentistry. Each applicant must furnish plaster models for a full (upper and lower) denture, from impressions taken from the mouths, or from zinc dies; must prepare Bite Plates, mount on a good articulator, set up teeth with Normal Occlusion and finish to the point of flasking.

Rule XII. Practical Crown Work. Each applicant must construct complete a crown, either Porcelain faced or shell as designated by Examiner.

Rule XIII. The Board at its discretion may change, or add to, any of the requirements under the three preceding rules.

(Applicants taking the examination under the terms of reciprocal contracts with other States will be required to take the examinations in practical work only.)

Miscellaneous.

Rule XIV. Two regular examinations will be held each year; the Spring examination in June and the Fall examination in December.

Rule XV. The law makes no provision for temporary licenses to practice between examinations, and none will be granted.

Rule XVI. In the theoretical and practical work of the examination the applicant must have a general average of seventy-five per cent. In operative, prosthetic and crown work, if the applicant falls below seventy-five per cent he shall fail to pass in theory, if applicant fall below fifty per cent on any subject he shall fail to pass; but may be re-examined on that in which he failed at next regular examination.

Rule XVII. All written examinations shall be on paper furnished by the Board.

Rule XVIII. At the opening of the examinations the applicant will be furnished with an envelope containing a card with a number. The applicant will write his or her name on this card, seal the envelope, and use this number on all examination papers. In no case shall the applicant's name appear on the examination paper. The sealed envelopes will be handed to the Secretary and will not be opened until all papers are graded.

Rule XIX. Anyone detected in trying to give or obtain aid shall be dismissed

from the class and his or her paper for the entire work will be rejected.

Rule XX. All writing must be legible and, together with spelling and use of correct language, will be taken into account in grading the answers. A correct set of answers to the questions on any one paper shall entitle the writer to the full mark on that subject, viz: one hundred points. Partial or imperfect answers will be graded by the Examiner in accordance with their degree of fullness and correctness.

Rule XXI. Applicants are expected to be punctual at all examinations.

Rule XXII. Read the questions very carefully and do not give any information in the answers that is not asked for.

Rule XXIII. Write answers in the order of the questions. Do not copy the questions on your examination paper, but write the number of each question, in Roman numerals, in center of page before the answer.

Next meeting will be held beginning July 14, 1919, at Oklahoma City, Okla.

Address all communications to

H. R. WATKINS, Secretary,
231 Am. Nat'l Bank Bldg.,
Oklahoma City.

THE FORSYTH DENTAL INFIRMARY FOR CHILDREN.

140 The Fenway, Boston.

Undergraduate Assistants.

During the months of June, July, August and September an opportunity is offered by the Trustees of the Forsyth Dental Infirmary for Children to a limited number of undergraduate students to act as assistants in the clinics of the Infirmary. This privilege permits a student to obtain unusual clinical advantages in the various departments of the institution where Operative Dentistry, Orthodontia, Nose and Throat & Oral Surgery, Radiography, Pathological Diagnosis and Research Work are continually carried on.

Operators' gowns, instruments and filling materials are furnished. Over three hundred children are treated daily.

For further details apply before May 15th to the Director, Dr. Harold DeW. Cross, 140 The Fenway, Boston, Mass.

THE FORSYTH DENTAL INFIRMARY FOR CHILDREN.

140 The Fenway, Boston.

Permanent Staff Appointments.

A complete examination of graduates in dentistry (of less than three years standing) for appointments to positions on the Permanent Staff for full and one-half time service will be held early in June at the Infirmary.

Appointments will be made for one or two years as follows:

Full time service requiring operating five and one-half days a week at a salary of $1000 a year.

One-half time service requiring operating six half-days a week, either forenoon or afternoon, at a salary of $500 a year.

These appointments will be made subject to satisfying the requirements of the Massachusetts State Board of Registration in Dentistry and to "qualifying" in the practical work of the clinics during one month's trial.

Members of the state staff are entitled to the advantages of reports and clinics by experts in the various branches of Dentistry from different parts of the world in addition to the numerous special and regular clinics and lectures.

Operators after serving four months are eligible, by qualifying, for appointments in the special clinics where Post Graduate work is given.

The operators on this staff have the advantage of the clinics and lectures of the Post-Graduate School of Orthodontia.

The Infirmary clinics provide unusual advantages in the various departments of the institution where Operative Dentistry, Orthodontia, Nose and Throat & Oral

Surgery, Extracting, Novocaine Technic, Radiography, Pathological Diagnosis and Research work are continually carried on.

The average number of cases treated daily in the various clinics is over 300.

Supplies and necessary operating instruments are furnished; up-to-date apparatus including electrical engines, sterile instrument trays, fountain cuspidors, compressed air, and the modern operating-room-type of lavatories are available for use.

A diploma of service will be issued by the Trustees to each member of this staff who has completed this term of service in a satisfactory manner.

Applications for the above positions should be made not later than May 15th.

Information and the date of the examination will be furnished to those interested.

Harold DeW. Cross, D. M. D. Director,
140 The Fenway, Boston, Mass.

ACTION TO REVOKE LICENSE.

Dr. William D. McErlain,
34 Main St., Jamestown, N. Y.

Sir:—You are hereby notified that you are charged with unprofessional and immoral conduct in the practice of dentistry as is set forth in the annexed petition and affidavits, copies of which are herewith served upon you.

You are further notified that a committee of three members of the State Board of Dental Examiners of the state of New York has been duly appointed for the purpose of considering such charges against you and that a meeting of said committee will be held on the 31st day of October, 1918, at the County Court House in the City of Buffalo, N. Y., at 10 o'clock a. m.

You are further notified that said hearing will be given in accordance with the statutes as made and provided in such cases and the rules of the State Board of Dental Examiners. A stenographic record of all the proceedings will be made; witnesses will be sworn and examined; you are given an opportunity to appear and to be represented by counsel and will be given an opportunity to produce and examine such witnesses as you see fit, whose testimony is competent and you may cross-examine such witnesses as may appear against you.

Very truly yours,
(Signed) A. M. WRIGHT,
President, State Board of Dental Examiners.

Dated October 2, 1918.

In the matter of the application of Minor J. Terry for revocation and cancellation of the dental license of William D. McErlain and for the annulment of his registration.

To the Regents of the University of the State of New York and the State Board of Dental Examiners.

The petition of Minor J. Terry respectfully shows:

1. Petitioner is the Secretary of the New York State Board of Dental Examiners, duly qualified and acting as such and that he resides in the city of Albany, N. Y.

2. That William D. McErlain is a licensed and practicing dentist, conducting a dental office at 34 Main Street, in the city of Jamestown, N. Y.

3. Petitioner hereby charges the said William D. McErlain, under oath, with gross ignorance and inefficiency and unprofessional and immoral conduct as follows, to-wit:

a. Upon information and belief that said William D. McErlain has displayed gross ignorance and inefficiency in the practice of his profession in that he failed in the attempt to properly fit, make and replace a full upper and lower dentures for one Mandana Durlin, of Pittsfield, Pa., and for one S. L. Rice, of Jamestown, N. Y.

b. That said William D. McErlain is guilty of unprofessional conduct in that he did publish and circulate fraudulent and misleading statements as to his skill and method of practicing dentistry; that he published and circulated by newspaper advertisements, circulars and otherwise, statements holding himself out to the public as practicing dentistry without causing pain.

c. Upon information and belief that said William D. McErlain advertised statements which were deceptive and misleading and which were calculated to and did defraud the public and which did deceive and defraud the said Mandana Durlin, of Pittsfield, Pa., from whom the said McErlain exacted the sum of seventeen dollars on or about the 7th day of August, 1917, for a full upper and lower set of teeth, whereas the said Mandana Durlin was led to believe by the dental adver-

tisements published by said McErlain that she could and would be able to procure the same at his office for the sum of five dollars; and that he did deceive and defraud the said S. L. Rice, of Jamestown, N. Y., on or about February 1, 1918, when he exacted from him the sum of fifteen dollars for a full upper and lower set of teeth, the said Rice having been led to believe that he could procure such set of teeth for five dollars thru the dental advertisements published by said McErlain, in the Jamestown dailies, and which were misleading and deceptive.

d. That the said McErlain did practice dentistry under an assumed and trade name between the 18th day of January and the 18th day of February, 1918; that he practiced dentistry under a name other than his own proper name and not the name used on his license and certificate of registration and certificate of registration and that he has practiced dentistry under the name and displayed the sign of the "Rex Dentist" on the building wherein his office is located, all of which was in violation of the provisions of the public health law relative to the practise of dentistry in the State of New York.

e. That said McErlain advertises himself to be a practitioner of painless dentistry and advertises full sets of teeth for five dollars, whereas he charges his patients various prices for the same in excess of the sum so advertised; that he advertises to do high grade work, whereas in fact the work which he does is of a very inferior character; that he advertises the alveolar method of restoring missing teeth, which is a fictitious and misleading statement; that he advertises to "Put the tooth to sleep, not the patient," which is a fictitious, deceptive and misleading statement; that he advertises to make roofless, gumless plates with teeth riveted on with platinum, which is a misleading, deceptive, dishonest and untruthful statement.

f. Upon information and belief, that said McErlain was guilty of immoral conduct committed in the city of Olean between the 1st day of March and the 1st day of June, 1917, while he was in the employ of Dr. S. A. Skaden, a dentist having an office in said city. The said McErlain used moneys belonging to said Skaden for his own personal benefit without the consent and against the instructions of said Skaden and unlawfully appropriated such moneys and other personal property belonging to said Skaden to his own use.

WHEREFORE the petitioner prays for the revocation and cancellation of the dental license which was granted to William D. McErlain on the 12th day of March, 1917, and for the annulment of his county registration or registrations as a dentist within the State of New York and for such further action in the premises as may be just and proper.

MINOR J. TERRY.

State of New York,
County of Albany, SS:

Minor J. Terry, being duly sworn, says that he is the petitioner above named, that he has read the aforegoing petition and knows the contents thereof; that the same is true to the knowledge of the petitioner except as to the matters as therein stated to be alleged upon information and belief and as to those matters, he believes it to be true.

MINOR J. TERRY.

Sworn to before me this 1st day of October, 1918.
W. MASON, Notary Public,
Albany County, N. Y.

ANNOUNCEMENT OF THE JOURNAL OF DENTAL RESEARCH.

Continuing the Journal of the Allied Dental Societies.

(A journal on stomatology: devoted to the advancement and dissemination of knowledge pertaining to the mouth and teeth, and to their relation to the body as a whole.)

Summary.

A research journal in stomatology and dentistry, without advertising matter.

Issued quarterly, one volume per calendar year, beginning with the March number (to be issued on or about April 25, 1919.)

Subscription price: $5.00 per volume (calendar year) containing at least 500 pages (printed page, 7x4¼ inches.)

To be supported by an endowment fund.

Edited by a large number of investigators in dentistry, medicine, and biology.

Editorial Office: College of Physicians and Surgeons, 437 W. 59th Street, New York City.

Printing office: Waverly Press, Baltimore, Md.

In order that the gist of each research to be described in this journal may be made promptly and effectively available to dentists and physicians, abstracts of each paper will be published, in the table of contents for each number, in practical terms for practical men. Summaries at the ends of the papers will show the scientific conclusions at a glance.

Details.

The Journal of Dental Research has been called, by one of its dental editors, "a strictly scientific research magazine—something entirely new in dental literature."

It publishes original research in dentistry and stomatology, and in the arts and sciences allied with and applied to them.

It is edited by the following well-known dental, medical, and biological investigators.

The editorial office is located in the Biochemical Department of Columbia University (Wm. J. Gies, Executive Officer of the Department and of the Board of Editors), College of Physicians and Surgeons, 437 West 59th Street, New York City.

The Journal of Dental Research begins its career as a quarterly. The first number (March) will be issued on or about April 25, 1919; the second (June), on or about July 1, 1919.

Each volume will contain about 500 pages of matter devoted exclusively to original research. In addition there will be supplementary pages, independently numbered, devoted to the scientific proceedings of dental and stomatological societies, which will be published at the expense of the societies concerned.

The subscription price of the Journal of Dental Research is identical with that of most research journals, namely, five dollars ($5.00) per volume (for a calendar year).

Commercial advertising matter will be excluded—a novelty in dental journalism.

The Journal of Dental Research will be financed, as a University is supported, with public-spirited gifts for this purpose, also from a cumulative, permanent, endowment fund to be created, and from subscriptions for its successive volumes—not from advertisements of goods for sale.

The subscription price will be lowered as soon, as fast, and as far, as the philanthropic support of the journal may make it possible to reduce it.

The Journal of Dental Research will not be indifferent to the needs and expectations of busy dentists and physicians, but will seek to make the new journal a necessity, a help, and a gratification, for every dentist and physician. Effective reviews of important developments in research, written by those most competent to do so, and summarizing, clearly and reliably, the knowledge of practical subjects, will be published from time to time.

The "table of contents" in each number will include a series of abstracts, or brief interpretations of the contained papers, so that dentists and physicians may be shown, in a few words, the practical applications of the facts in each paper in the number. At the end of each paper there will be a summary of general conclusions, so that the paper's scientific aspects may be seen at a glance by those who may wish to ascertain the gist of the paper before time is given to its detailed perusal. Instead of "shooting over the heads" of dentists and physicians generally, this journal, by the execution of these plans of presentation, will be not only an archive of original research for the student and scholar, but also a series of original contributions to stomatology and dentistry is practical terms for practical men.

Accepted papers may be subjected, in the issues in which they appear, to formal independent critical analysis by one or more experts selected for the purpose; but in all such instances authors will have full opportunity to reply in the same issue. Execution of this plan, also, will help the busy practitioner promptly to appraise the individual papers at their real values.

Editorial office, Journal of Dental Research.
437 West 59th Street, New York City.
March 31, 1919.

In Memoriam

1st Lt. Gale Friday—Born in Fremont, Indiana, March 1, 1896; graduate of the Fremont High School and the Indiana Dental College (1917); commissioned First Lieutenant in the Dental Corps in August, 1917; began practicing in Orland, Indiana, in October, 1917; called to Camp Sheridan on September 20, 1918, and assigned to the 27th Machine Gun Battalion. Died after a week's illness with pneumonia, on November 14, 1918; Lt. Friday was a member of the Indiana State Dental Association and the National Dental Association.

James Eli Hurst—Lapeer, Michigan; graduated from Marquette University, 1911; practiced in Carlton, Michigan, two years, Detroit one year, Lapeer four years; member of the Michigan State Dental Society and National Dental Association; died at his home January 24 following one week's illness caused from influenza pneumonia; age 32 years.

RESOLUTION.

Santa Cruz District Dental Society,
Monterey, California, March 6, 1919.

Editor Journal:

Whereas, in the providence of an allwise Creator, our fellow member, Dr. Vance W. Bliss, was taken away in his early youth and

Whereas, his ability and skill as a practitioner, and his keen interest in professional affairs, and his exceedingly affable disposition, we keenly feel his loss as a member of the dental fraternity, and especially of this society, and

Whereas, his noble and patriotic spirit in giving his services in benefit to his country, be it therefore

Resolved, that we, the members of this society, feel deeply his loss and hereby express our appreciation of his worth as a member of our society, and our sorrow over the untimely close of a career which we feel sure, would have been full of success, and be it further

Resolved, that a page on our minute book be set aside and the Secretary be instructed to inscribe thereon these resolutions and a copy be sent to his parents, also to the professional Journals for publication.

Fraternally yours,
SANTA CRUZ DISTRICT DENTAL SOCIETY.
C. E. Balzarini, Secretary.

MEMORIAL RESOLUTIONS—LOUIS S. LAPIERRE, SOUTH BEND, IND.

At a special meeting of the St. Joseph County Dental Society held on the 12th day of February, 1919, the following in-memoriam resolutions on the death of Dr. Louis La Pierre were adopted:

Whereas, the Supreme Master of the Universe in His infinite wisdom has seen fit to summon to his heavenly home our dearly beloved friend and fellow member, Dr. Louis S. LaPierre, and

Whereas, by the death of our honored

and esteemed colleague and friend, the St. Joseph County Dental Society feels that it has been sorely bereaved in a personal as well as a professional manner. Personally because of his courteous and cheerful conduct in our every-day social relation, and professionally his life work and association have been an example and stimulus to the many who knew him well, and were privileged to come under his influence; therefor, be it

Resolved, that we, the St. Joseph County Dental Society, extend our sincere sympathy to Mrs. LaPierre and son, in their bereavement, which is the sorrow of each and every member of the society and the profession-at-large. We wish to express our high regard for the worth and character of this sterling man, by whose death the profession of dentistry has lost an energetic, ethical and worthy representative and this body a devoted, loyal and helpful member and be it further

Resolved, that a copy of these resolutions be spread upon the minutes of the society and a copy forwarded to his family. Signed:

F. G. CONKLIN,
E. E. PAXSON,
CLEM E. SHIDLER,
T. J. WALSH,
Committee.

RESOLUTIONS.

Whereas, The members of the Board of Governors of the Maryland State Dental Association have heard of the passing of Dr. W. E. Dieffenderfer, a member of the District of Columbia Dental Society, and a fellow associate, by affiliation, of this Association.

Resolved, That in the death of Dr. Dieffenderfer, the dental profession has sustained a great loss—a man of great versatility, an ever-ready worker in his chosen profession and who on innumerable occasions served this Association with great credit to himself in its clinics to the helpfulness and improvement of our members. Be it for this

Resolved, That we desire to convey an expression of our sympathy to his widow, thru the members of his own society and therefore request that these resolutions be spread upon the minutes of the District of Columbia Dental Society as they will be upon the minutes of this Association and a copy of the same be transmitted by you to Mrs. Dieffenderfer.

Respectfully submitted,

F. F. DREW,
W. W. DUNBRACCO,
Committee.

RESOLUTIONS

Adopted by the Academy of Stomatology of Philadelphia, Pa., on February 20, 1919, in Memoriam of Dr. Simeon Hayden Guilford.

Whereas, Death claimed our fellow member and friend, Dr. Simeon H. Guilford on January 19, 1919, in his 78th year, we, the members of the Academy of Stomatology of Philadelphia, assembled on February 20, 1919, realize that in his death we have lost not only a friend and constant associate, helpful in daily contact, but that the profession has lost one of its most useful teachers and skillful collaborators in both manual and intellectual branches. As a teacher he was forceful, practical and possessed in a marked degree the ability to transmit his knowledge and was so fair and honest in all his dealings with students that he was universally beloved by them. Wherever dentistry was practiced there was he known and honored.

He was born at Lebanon in 1841, graduated at Franklin and Marshall College in 1861. He began the study of dentistry in 1863, receiving the degree of Doctor of Dental Surgery in 1865. He was given the degree of A. M. in 1864 and the honorary degree of Ph. D. in 1886 by his Alma Mater and the honorary degree of

D. D. S. in 1864 by the Philadelphia Dental College.

He began practice at Lebanon in 1865 and removed to Philadelphia in 1872, where he practiced until his death, excepting for one year in Paris, France.

In 1881 he was elected to the chair of Operative and Prosthetic Dentistry and Orthodontia in the Philadelphia Dental College and held it until 1918, when he resigned. In 1895 he was elected Dean of the College, which office he held until 1918, with the exception of three years, 1905 to 1908. At his resignation in 1918 he was elected Dean Emeritus, which he was at his death.

He was the author of two works, "Nitrous Oxide," published in 1887, and "Orthodontia," published in 1889. He wrote the sections on "Orthodontia," "Anomalies of the Teeth and Maxillae" and "Hypercementosis" for the American System of Dentistry, and the chapters on "Preparation of Cavities" and "Contour Fillings" for the American Textbook of Operative Dentistry, also later a chapter on "Hypersensitive Dentine."

He was a frequent and lucid contributor to the best periodical literature of his profession. He has served as President of the National Association of Dental Faculties, the Pennsylvania State Dental Society, Odontological Society of Philadelphia, the Academy of Stomatology and as Vice-President of the National Dental Association.

Besides holding active membership in many dental organizations, he was an honorary member of the First District Dental Society of New York, of the State Dental Society of New York, a Fellow of the American Academy of Dental Science of Massachusetts, an honorary member of the American Dental Society of Europe and other organizations.

He was married in 1869 and is survived by his wife, a daughter and a son. He is interred at Arlington Cemetery, Lansdowne, Pa.

In the death of Professor Guilford, therefore be it resolved, that the Academy of Stomatology has lost one of its most distinguished members, who has been an honor to his profession, whose labors for its advancement have been indefatigable, whose simplicity and honesty have been as great as his intellectual force and personal charm and unabated to his death and that we, feeling our personal loss hereby express our sorrow and be it further,

Resolved, That a copy of these resolutions be spread upon the minutes of the Academy and a copy be sent to the bereaved family and to the journals for publication.

EDWIN T. DARBY.
ROBERT HUEY.
OTTO E. INGLIS.